

EFFECTS OF THE FRESH LEAVES OF *SPONDIAS MOMBIN* L. ON MILK PRODUCTION OF WEST AFRICAN DWARF (WAD) EWES AND THEIR LAMB'S GROWTH PERFORMANCE

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ABSTRACT

The high pre weaning mortality recorded in West African Dwarf lambs is caused by insufficient breast milk. To reduce this pre weaning mortality, an experiment was conducted to evaluate the effect of *Spondias mombin* leaves on ewe's milk production and growth performance of their lambs in southern Benin. The assay was conducted on 18 lactating ewes divided into three homogeneous groups of 6 animals each who received supplementation of leaves of this plant. The resulted outcomes indicate that the leaves of *Spondias mombin* have a significant effect on milk production of ewes and lambs weight gain. The average value of 94.00; 94.67 and 68.67 g/day were found in group 1, group 2 and control group, respectively. However, both types of treatment had similar effects on milk production of ewes and growth of lamb. The increase in milk production was on an average 36.40% and 37.2% in group 1 and group 2 respectively. Treatments by leaves of *Spondias mombin* had no significant effect on live weight change of ewes during lactation ($p > 0.05$). Also, the leaves of *Spondias mombin* had no significant effect on pH and ash content, protein and milk fat. This difference was significant for dry matter content of milk.

KEY WORDS: WAD sheep, *Spondias mombin*, milk production, lamb growth, Benin.

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INTRODUCTION

Medicinal plants have been used for centuries as remedies for human diseases because they contain components of therapeutic value (Nostro *et al.*, 2000; Tanaka, 2002). In Republic of Benin, 80% of the population being unable uses the traditional medicines to sustain their primary health care needs Deleke Koko *et al.*, (2011). Lactogenic plants are most of the medicinal plants that were used by traditional healers. The women with milk production deficiencies traditionally use some of these lactogenic plants to induce milk production or to increase milk yield. Breastfeeding in the first six months of life stimulates babies' immune systems and protects them from diarrhea and acute respiratory infections (UNICEF, 2006).

Milk is a food that is of great biological significance for lamb from the moment they are born and at weaning. The West African Dwarf (WAD) ewe is a poor milker, kept exclusively for meat, as the ewe's milk yield barely suffices to feed the lambs. Hence, lamb mortality is high in this breed, 20% according to Gbangboché *et al.*, (2005).

Nowadays, different plants found in nature are widely used in different fields including medicine, pharmaceuticals, food and health industries, but these plants are not widely used in veterinary. According to Mirzaei F and Hari Venkatesh K R (2012), ethno-veterinary alternatives are an option for small-scale livestock farmers who cannot use allopathic drugs or for those larger conventional farmers whose economic circumstances prevent the use of veterinary services for minor health problems of livestock.

Spondias mombin (family: Anacardiaceae) is a plant that is used for leaf, bark, roots and seeds. A juice of crushed leaves and powder of dried leaves of *S. mombin* are used to treat wounds, inflammations and abortifacients (Ayoka, 2008). *Spondias mombin* has been reported to be anti-helminthic (Ademola *et al.*, 2005) and anti-malarial (Caraballo *et al.*, 2004). The traditional healers in Nigeria recommend *Spondias mombin* to have lactogenic activity

(Oguike, 2008). Considering the extensive utilization of *S. mombin* in traditional medicine, the study is designed to evaluate the effect of fresh leaves of *Spondias mombin* on the WAD ewes to improve their milk production to reduce lambs mortality.

MATERIALS AND METHODS

Study environment

The Sheep Research Center of Faculty of Agronomy Sciences is located in the University of Abomey Calavi in the town of Abomey Calavi near Cotonou. The climate is of guinean type with two dry seasons (from November to March, July to September) and two rainy seasons (from March to July, September to November). The average rainfall is 1200 mm per year and the annual temperature ranges from 23°C to 30°C.

Collection of Plant material

Spondias mombin (Anacardiaceae), aerial parts (leaves) were collected from Abomey-Calavi, in June 2010 and were identified in Laboratory of Applied Ecology (Faculty of Agronomic Sciences, University of Abomey-Calavi, Benin). The dose of leaves of the plant (100 g/animal) administered was based on the quantity of leaves (100 g of fresh leaves) used by traditional healers in the treatment of milk production deficiencies in the women.

Management of animals

Eighteen (18) lactating WAD ewes, in the 2nd lactating season and weighing an average 14.2 ± 1.52 Kg were used in this experiment. Animals were housed in pens and lambs were kept with their dams and remained with them until their weaning at three months of age. They were treated against ecto and endoparasites and equally vaccinated against pests. Ewes were divided into three groups (six animals each) and were assigned at random to receive one of the treatments using complete randomized block design. The treatments included:

- **Control group:** received no treatment.

- **Group1:** Oral administration of *Spondias mombin* leaves - 100 g/animal/day for 3 days at the beginning of lactation.
- **Group2:** Oral administration of *Spondias mombin* leaves - 100 g/animal/day for the whole lactating period.

Animals grazed from 11 AM to 5 PM (for 6 h) on improved pastures consisting of *Panicum maximum* C1. The ewes received extra cotton oil cake protein of 200 g per day. They also received mineral supplements in the form of licks and water *ad libitum* throughout the trial period.

Data collection

For three months, milk production was recorded once in every two weeks, which began a week after lambing and hand milking was done once a day (6:30 AM). On the day of collection, lambs were isolated from their mothers at 6 PM. The next morning, ewes were hand milked before sent to the pasture. During the experimental period, the fresh milk samples were collected at a month's interval in each animal. The pH was determined immediately after collecting the samples using a pH meter INOLAB 730. The chemical composition of the milk was determined in the laboratory of chemistry, Agricultural Research Center of Agonkanmè (INRAB). Total solids, protein, ash total and fat were determined in the laboratory using the procedures of AOAC (1990).

The body weight of lambs were measured and recorded. Every two weeks, the lambs were weighed before feeding in the morning. Average daily gain (ADG) of lambs was calculated to compare the growth of lambs between groups. The body weight of ewes was also measured once a month.

Statistical analysis

The means and standard errors of the means of milk production, milk chemical composition, body weight of ewe as well as those of ADG

were determined. Statistical analysis of the differences between mean values obtained for treatments was performed using Minitab. Data were subjected to one way analysis of variance (ANOVA) followed by Tukey- Kramer multiple comparison test. In all cases, p values ≤ 0.05 were regarded as statistical significance.

RESULTS

Milk production

From the first week up to the ninth week of lactation, the daily milk production in groups 1 and 2 was higher than control groups. From the ninth week to the end of lactation, the daily milk production was similar in three groups (Figure 1). This is evident on the lactation Table 1. The daily milk production was significantly higher ($p < 0.05$) in groups 1 and 2 than Control group ($p < 0.05$) from the beginning to 7th week of lactation. The daily milk production at 7th week was 83.80; 85.56 g/day and 66.97 g/day in Group 1, Group 2 and control group, respectively (Table 1). From the 9th week to the end of lactation, the daily milk production is similar in all groups ($p > 0.05$).

Body weight of lambs and ewes

The body weight of lambs increased gradually and similarly in three groups during the first 2 weeks (Figure 2). After the first two weeks, this increase was much more pronounced in the lambs of groups 1 and 2 (weaning body weight > 8.5 Kg) than control group (weaning body weight < 7.5 Kg).

Analysis of variance (Table 3) shows that the average daily gain (ADG) in 0–15days and 15–30 days was significantly higher in the groups 1 and 2 than Control group (ADG in 0–15days: 94 g/day; 94.67 g/day for Group 1 and 2 respectively, against 68.67 g/day for control group) ($p < 0.05$) (Table 3). This difference is not significant in 30–45days, 45–60days, 60–75days and 75–90 days ($p > 0.05$) in all the three groups. The ADG of lamb was comparable in Group 1 and Group 2.

Figure 1: Curves of lactation of ewes according to week of lactation and treatments

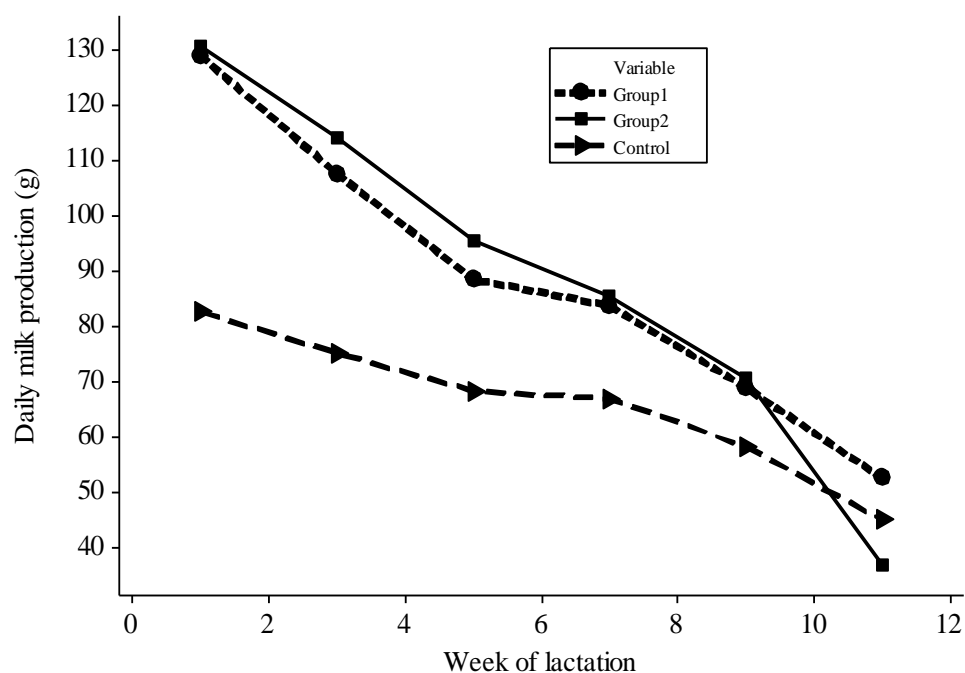


Table 1. Daily milk production (g) (Mean ± Standard deviation)

Week	Control	Group1	Group2	Meaning
1	82.00 ± 6.49 b	128.93 ± 19.44 a	130.60 ± 7.44 a	*
3	75.18 ± 5.79 b	107.63 ± 13.77 a	114.00 ± 11.16 a	*
5	68.33 ± 5.78 b	88.49 ± 13.22 a	95.60 ± 7.33 a	*
7	66.97 ± 4.23 b	83.80 ± 15.06 a	85.56 ± 10.73 a	*
9	58.31 ± 5.24 a	69.00 ± 4.18 a	70.60 ± 3.21 a	
11	45.11 ± 6.83 a	52.60 ± 7.86 a	57.00 ± 8.60 a	

* = $p < 0.05$

Table 2. Milk physico-chemical composition (Mean ± Standard deviation)

Parameters	Control	Group1	Group2	Meaning
Ph	6.94 ± 0.01a	6.94 ± 0.01a	6.96 ± 0.01a	
Total solid TS (%)	15.06 ± 0.22a	14.15 ± 0.04b	14.13 ± 0.05b	*
Ash content (% TS)	2.04 ± 0.09a	2.09 ± 0.11a	2.13 ± 0.15a	
Protein (% TS)	5.22 ± 0.12a	5.06 ± 0.01a	5.02 ± 0.03a	
Fat (%TS)	6.53 ± 0.32a	6.46 ± 0.28a	6.31 ± 0.21a	

* = $p < 0.05$

The sex of the lamb had significant effect on average daily gain (ADG) of lamb in 0–15 days (85.24 g/day for female against 95.00 g/day for male) ($p < 0.05$) (Table 3). However, the sex of lamb had no effect on average daily gain (ADG) of lamb at 15–30 days, 30–45days, 60–5days and 75–90days ($p > 0.05$). Also the treatments and sex of lamb had no effect on initial and final body weight of ewe ($p > 0.05$) (Table 3).

Milk physico-chemical composition

The pH of milk found no difference in the three groups making it statistically

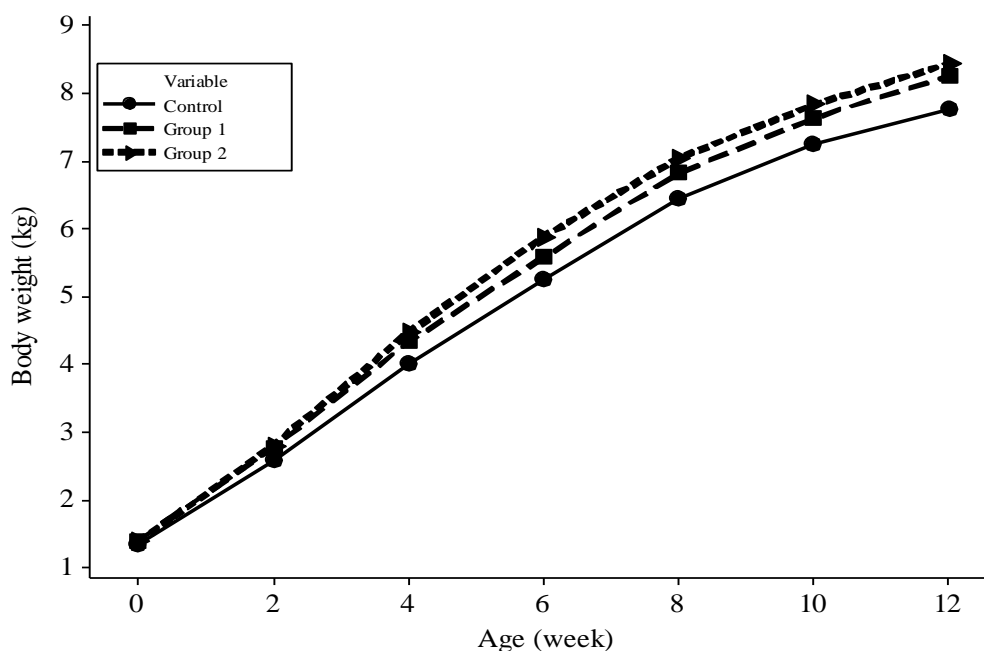
insignificant ($p > 0.05$) (Table 2). Regarding the chemical composition, it was noticed that the milk of ewes in control group contained significantly less water compared to groups 1 and 2 ($p < 0.05$). The average value of 15.06; 14.15 and 14.13 were found for total solids in control group, Group 1 and Group 2 respectively (Table 2). The ash content, protein and fat were not significantly different between the groups ($p > 0.05$) (Table 2). The protein was 5.22; 5.06 and 5.02 in control group, Group 1 and Group 2 respectively (Table 2).

Table 3: Body weight, Average Daily body weight Gain (ADG) (Mean ± Standard deviation)

Variables	Treatments			Sex	
	Group1	Group2	Control	Female	Male
ADG of lamb (g/day)	(6)	(6)	(6)	(8)	(10)
0--15days	94.00 ± 9.25 a	94.67 ± 4.47 a	68.67 ± 6.41 b	85.24 ± 7.90 a	95.00 ± 6.67 b
15--30days	108.01 ± 10.38 a	111.34 ± 7.67 a	94.00 ± 7.23 b	99.05 ± 10.84 a	107.92 ± 9.75a
30–45days	90.00 ± 9.72 a	94.00 ± 9.83 a	89.34 ± 7.60 a	81.43 ± 11.03 a	90.00 ± 12.60 a
45--60days	82.67 ± 4.94 a	85.34 ± 8.37 a	78.67 ± 2.98 a	80.96 ± 4.18 a	83.34 ± 7.56 a
60--75days	54.00 ± 6.41 a	60.00 ± 4.71 a	52.67 ± 9.25 a	55.77 ± 10.13a	55.42 ± 4.34 a
75--90days	40.67 ± 9.25 a	41.34 ± 8.01 a	35.34 ± 7.30 a	38.57 ± 9.00 a	39.59 ± 7.86 a
Ewes Body weight (kg)	(6)	(6)	(6)	(8)	(10)
Day of birth	13.55 ± 0.87 a	14.20 ± 1.55 a	14.35 ± 0.57 a	13.63 ± 1.38 a	14.31 ± 0.76a
30 days	13.96 ± 0.79 a	14.90 ± 1.63 a	14.87 ± 0.61 a	14.18 ± 1.47 a	14.84 ± 0.81 a
60 days	14.31 ± 0.89 a	15.22 ± 1.49 a	15.77 ± 0.79 a	14.73 ± 1.57 a	15.25 ± 0.83 a
90 days	14.85 ± 0.70 a	16.02 ± 1.33 a	16.42 ± 1.04 a	15.48 ± 1.41 a	15.95 ± 1.10 a

a, b, c = Means with different superscript letters on the same row differ significantly ($p < 0.05$).

Figure 2. Lamb body weight according to age and treatments



DISCUSSION

The floristic and ethnobotanic aspects of lactogenic plants have been studied extensively (Bailey and Day, 2004; Wynn and Fougere, 2007); however, little is known about their biological activities. In this study *Spondias mombin* was investigated for its activity on milk production. Our results on milk production indicate that the leaves of *Spondias mombin* significantly stimulated milk production in treated ewes compared to control group. This activity of the leaves of *S. mombin* is due to the ability of leaves to stimulate the hormones that initiate milk biosynthesis (Houdebine, 2007) and causing development of breast tissue (Lompo-Ouedraogo *et al.*, 2004). The presence of steroidal, saponins, sapogenins and tannins constituents in leaves of *Spondias mombin* (Njoku and akumefula 2007; Igwe 2010) contributes in its lactogenic effect (Goyal *et al.*, 2003; Mirzaei F and Hari Venkatesh K R, 2012). The increase in milk production was on an average 36.40% and 37.2% in group 1 and group 2 respectively. Our results were comparable to those of Mishra (2006) and Oguike (2008). Mishra (2006) and Oguike (2008) show that *Galega officinalis* herb and *Spondias mombin* plant can increase milk supply up to 50% and 32.59%, respectively.

The pH of the milk in the three groups is comparable. Regarding the chemical composition, it is noticed that the milk in the control group contains less water. This difference can be explained by several factors, including genetic factors (individual) and the treatments (feed) Atti and Rouissi (2003). Other chemical constituents are identical in the three groups and are statistically insignificant. These results are similar to those reported by Rouissi *et al.*, (2007) in an assay where the soybeans were replaced by horse bean in the feed of ewes. The protein of milk obtained in this study is similar to the one of Adewumi and Olorunnisomo (2009): 5.52% in WAD ewes. Slightly higher values (7.08% from fat and 6.12% from protein) were found in WAD ewes by Ekeocha (2012). This difference could be explained by feeding regimes, ration components and forage, grain ratios that affected milk composition.

The positive effect of the treatment (*S. mombin*) on growth performance of lamb is due to milk production performance of their mothers. The milk consumed by the lambs in treated groups is higher than the milk consumed by the lambs in control group. Aside

from overwhelming importance of milk to humans, ewe's milk production is the foundation for good lamb growth performance (Ogunwole, 2004). Increased milk intake is significantly associated with increased body weight (Korman, 2001; Niznikowski *et al.*, 2006).

As shown in Table 3, effect of sex on growth performance of lamb observed in 0–15 days was significant. As for birth weight, Idris *et al.*, (2010) and Gbangboche (2006) also found significant effect of sex on growth performance. They indicated that in the same managerial conditions, males were significantly heavier than females at birth. In this study, the effect of sex on lamb growth disappears after 15 days. These results disagree with Kumar *et al.*, (2007). This author reported that, the body weight of male lamb was higher than the female lambs at all ages. The results obtained by this author could be explained by the difference in the managerial conditions

(managerial conditions of males differ to managerial conditions of females).

CONCLUSION

This study on the effect of leaves of *Spondias mombin* on dairy ewes showed positive results of this plant on milk production and growth performance of the lambs. It was noticed that the two treatments (3 days and continual) had similar effect on the performances of the sheep. It has been concluded that *Spondias mombin* is believed to assist initiation maternal milk production and not maintain lactation; hence this plant can be considered as an alternative for lactogenic hormones for inducing lactation in WAD ewes.

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