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# Lactogenic effects of the leaf's powder of *Spondias mombin* L. on West African Dwarf (WAD) sheep performance and serum prolactin level in Republic of Benin

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## ABSTRACT

Twenty four (24) dairy ewes at the 4<sup>th</sup> stage of lactation were used to assess the milk production and serum prolactin level of ewes treated with leaf's powder of *Spondias mombin*. The lactating ewes were selected and divided into 4 groups of 6 ewes per group: control group (no fed powder of *Spondias mombin*), Galactin group (no fed powder of *Spondias mombin* but treated with lactogenic drug) and groups treated with powder of *Spondias mombin* (group single dose and group double dose). The parameters measured include daily milk production, body weight of lambs and ewes. The resulted outcomes indicate that ewes that received powder of *S. mombin* and Galactin produced more milk than controls. The average daily increases in milk production were 9.92%, 14.25% and 18.88% in single dose, double dose and Galactin groups, respectively compared to control group. Lamb weight gain was also significantly higher than that in the control group. The treatments did not influence body weight of ewe. The daily weight gain of 93.12; 97.47; 99.07; 86.76 g/day were found in single dose, double dose, Galactin and control groups, respectively. The results of the blood analysis of hormone showed that serum prolactin levels increased in the group treated with powder and Galactin compared to control group.

**Key words:** Lactogenic plant, Milk production, Republic of Benin, Sheep, *Spondias mombin*.

## INTRODUCTION

Sheep and goat share many characteristics in common and play important role in the socio-economic life of the people of Nigeria Enwelu (2015), like people of Republic of Benin. The main problem of the sous sector of small ruminant is the high mortality in the livestock due to diseases and poor feeding. 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. The primary cause of increased milk production are reduction of intramammary pressure from more frequent milk removal, reduction in the inhibitory effects that certain milk components exert within milk cells and increased hormonal concentration related to milk production as prolactin (Anjuli Aggarwal and Mahendra Singh, 2004).

*Spondias mombin* Linn is a fructiferous tree that all parts are a potential source of highly nutritious feed stuff and phytomedicine. All parts of the tree are ethnopharmacologically important. In a recent review, Ayoka *et al.*, (2008) reported several activities that have been associated with the plant extracts. Some reported pharmacological activities include antibacterial (Corthout *et al.*, 1994), antiviral (Corthout *et al.*, 1992), anti-microbial (Abo *et al.*, 1999), anti-malarial (Carabalo *et al.*, 2004), anti-helminthic (Ademola *et al.*, 2005), molluscicidal (Corthout *et al.*, 1994), anti-diarrhoea (Akubue *et al.*, 1983), antiinflammation (Abad *et al.*, 1996), haemostatic (Kone-Bamba *et al.*, 1987), abortifacient (Offiah and Anyanwu, 1989), purgative (Akubue *et al.*, 1983), hypnotic (Ayoka *et al.*, 2005). Many researchers showed lactogenic activity of medicinal plants such as *Trigonella foenum graecum* and *Lepidium sativum* L. (Tomar,

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1996). In Republic of Benin, ethno botanical survey of traditional healers recommends *Spondias mombin* to have lactogenic activity (Akouedegni, 2013). Igwe (2008) and Akouedegni (2013) proved lactogenic activity in the ewes treated with fresh leaves of *Spondias mombin*.

Considering the extensive utilization of *S. mombin* in traditional medicine, the present study was undertaken to investigate the effect of leaves powder of *S. mombin* on milk production and prolactin level in lactating WAD ewes to improve lamb's growth performance.

## 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 up to March, July to September) and two rainy season (from March up to July, September to November). The average rainfall is 1200 mm per year and the annual temperature ranges from 23°C to 30°C.

### Plant materiel and powder obtained

The results of the phytochemical analyses of *Spondias mombin* leaves realized by Igwe (2008) showed the presence of saponins ( $4.80 \pm 0.35\%$ ), alkaloids ( $3.40 \pm 0.10\%$ ), flavonoids ( $2.80 \pm 0.36\%$ ), tannins ( $1.47 \pm 0.06\%$ ), oxalates ( $0.92 \pm 0.09\%$ ), phytates ( $1.73 \pm 0.19\%$ ) and cyanogenic glycosides ( $0.01 \pm 0.00\%$ ). The same author showed that the leaves are rich in nutrients, especially total carbohydrate ( $68.92 \pm 2.00\%$ ), moisture ( $15.13 \pm 0.57\%$ ), crude protein ( $11.04 \pm 0.71\%$ ), crude fibre ( $10.51 \pm 0.84\%$ ) and crude fat ( $4.82 \pm 0.34\%$ ).

For the experiment, the leaves of *Spondias mombin* were collected from Abomey calavi, in June 2011. The fresh leaves of *S. mombin* are harvested, dried in the room at 22°C and then processed into powder using electric grinder. The dose of powder of plant (1420 mg/kg of body weight) administered is based on the quantity of leaves (100 g of fresh leaves) used by traditional healers in treatment the milk production deficiencies (Akouedegni, 2013).

Galactin-vet is the trading lactogenic drug contains powders of *Leptadenia reticulata*, *Asparagus racemosus*, *Withania somnifera*, *Arundo donax*, *Cissampelos pareira*, *Foeniculum vulgare* and extracts of *Eclipta alba* and *Solanum nigrum*.

### Management of animals

Twenty four (24) lactating WAD ewes (age  $45 \pm 6.2$  months), in the 4<sup>th</sup> lactating seasons and weighting an average  $16.6 \pm 0.62$  kg were used in this experiment starting by two weeks before parturition and extended to 90 days after. Animals were housed at night and lambs were kept with their dams and remained with them until their weaning at three months of age. Ewes were divided into four groups (six animals each) and were assigned at random to receive one of four treatments using complete randomized block design. The treatments included: Control group: receiving 150 ml of water, Group Galactin: treatment with Galactin (administered orally, at a dose of 3 boli/animal once-a-day for 10 days at the beginning of lactation), Group single dose: receiving orally each day 1420 mg of powder of *S. mombin*/kg of body weight diluted in 150 ml of water for 3 days at the beginning of lactation and Group double dose: receiving orally each day 2840 mg of powder of *S. mombin* /kg of body weight diluted in 150 ml of water for 3 days at the beginning of lactation.

The animals were conducted on artificial pasture consisting of *Panicum maximum* C1 from 11 AM to 17 PM (for 6 h). All animals were treated against internal and external parasites. They were also vaccinated annually against "Peste des Petits Ruminants" (PPR) and brucellosis. The ewes received extra cotton oil cake protein of 300 g per day and per animal. Occasionally by-products such as corn, rice straw and groundnut hay there were given to them. 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 of ewes was estimated once every two weeks using a weigh-suckle-weigh (WSW) method (WSW: weighing before and after suckling). The lambs were isolated from their mothers at 18 h pm. The next morning, the lambs were weighed and then returned to their mothers and allowed to feed for 1 h. After feeding, the lambs were reweighed anew. The lambs were then left to the pens and the ewes were then sent to pasture. Back from the pasture, the WSW method was used again to assess the amount of milk suckled by the lamb during the day. The sum of the first and second daily milk suckled gave an estimate of the amount of milk suckled per day per lamb and the total milk production of individual lactations was calculated from birth to weaning.

The body weight of lambs was followed by weighing. The birth weight of lambs was 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. Body weight gain of lamb and suckled milk are typically used to measure milk efficiency calculating milk conversion lamb (MCL).

### Blood sampling and analysis

Blood samples were collected from the jugular vein from the animals within all groups (before birth, day of birth and 12 days after birth). The blood samples were directly collected into clean dried glass culture tubes and centrifuged. Serum prolactin levels were estimated by vidas using vidas kits provided by Biomerieux (France). The assay principle of vidas prolactin is an automated quantitative test for use on the mini vidas instruments, for the enzyme Immunoassay using ELFA technique (Enzyme linked fluorescent Assay).

**Statistical analyzes:** The means and standard errors of the means of milk production, prolactin level 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  $\leq 0.05$  were regarded as statistical significance.

**RESULTS AND DISCUSSION**

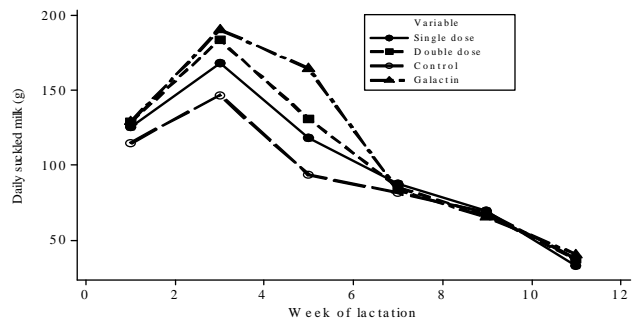
**Milk production**

From the first week up to the eighth week of lactation, the lactation curves (Fig 1) show that ewes that received the doses of powder of *S. mombin* (single dose, double dose) and Galactin produced more milk than control group. From the 7<sup>th</sup> week to the end of lactation, the daily suckled milk is similar in all groups (Fig 1). This is evident on the lactation table of four groups (Table1). The milk production (average daily and total milk production) was significantly higher ( $p < 0.05$ ) in the ewes of group Galactin and group double dose than groups single dose and Control. The milk production for the group single dose is higher than the control group.

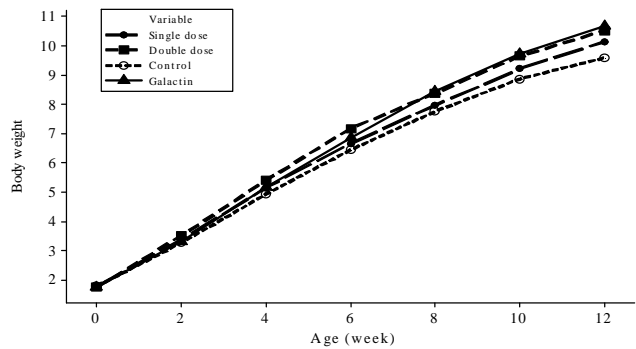
The treatments based powder of *S. mombin* stimulated milk production in treated ewes. Increasing of milk production of ewes treated with the powder of *S. mombin* is due to the lactogenic activity of leaves of *S. mombin* comparable to that of control group. Lactogenic activity of the powder of *S. mombin* would be due to the ability of leaves to stimulate the hormones that initiate milk biosynthesis as prolactin (Houdebine 1986) and causing development of breast tissue (Lompo-Ouedraogo *et al.*, 2004). The daily suckled milk obtained in this study was higher than that Oguike (2008) (82.26 g/day) and lower than that reported by Akouedegni *et al.*, (2012); 114.99 g/day. This difference could be due to many factors as methods used to estimate milk production, impact of enhanced environmental and managerial conditions, parity.

**Performance weight**

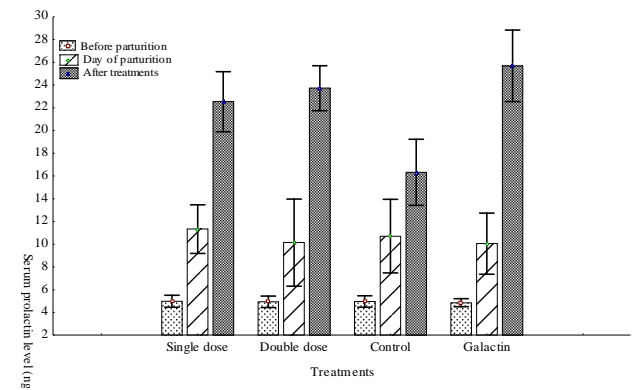
The treatment of powder of *S. mombin* had effect on the growth performance of lamb as shown in Fig 2. The analysis of variance showed that the weaning body weight and average daily gain (ADG) were significantly higher ( $p < 0.05$ ) in the lamb of the Galactin group, double dose group than single dose and Control groups. Treatments based powder of *S. mombin* and Galactin had no effect on either body weight of ewes, nor milk conversion lambs ( $p > 0.05$ ). The



**Fig 1:** Daily suckled milk according to week of lactation and treatment.



**Fig 2:** Lamb body weight according to age and treatments.



**Fig 3:** Serum prolactin level according to treatments.

**Table 1:** Daily suckled milk and total suckled milk (g), MCL according to treatments.

Parameter	Single dose	Double dose	Control	Galactin	Meaning
Daily suckled milk	100.55±494 <sup>a</sup>	105.62±91 <sup>ab</sup>	90.57±1.73 <sup>c</sup>	111.65±5.68 <sup>b</sup>	*
Total suckled milk	9126±411 <sup>a</sup>	9552 ±550 <sup>ab</sup>	8210±150 <sup>c</sup>	10137±587 <sup>b</sup>	*
MCL	1.08±0.08 <sup>a</sup>	1.09±0.04 <sup>a</sup>	1.04±0.06 <sup>a</sup>	1.13±0.04 <sup>a</sup>	

a, b, c: Means with different superscript letters on the same row differ significantly. \*P < 0.05.

**Table 2:** Body weight (kg) and Average Daily Gain (ADG) g/day of lambs and ewes according to the treatments.

Parameter	Single dose	Double dose	Control	Galactin	Meaning
<b>Lamb</b>					
birth body weight	1.78±0.13 <sup>a</sup>	1.76 ±0.14 <sup>a</sup>	1.80±0.11 <sup>a</sup>	1.78±0.12 <sup>a</sup>	
weaning body weight	10.16±0.34 <sup>a</sup>	10.53±15 <sup>ab</sup>	9.61±0.21 <sup>c</sup>	10.69±0.20 <sup>b</sup>	*
ADG (g/day)	93.12±3.47 <sup>a</sup>	97.47±2.13 <sup>ab</sup>	86.76±3.46 <sup>c</sup>	99.07±3.03 <sup>b</sup>	*
<b>Ewes</b>					
body weight	16.65±0.64 <sup>a</sup>	16.91±0.58 <sup>a</sup>	17.03±0.72 <sup>a</sup>	16.74±0.59 <sup>a</sup>	

a, b, c = Means with different superscript letters on the same row differ significantly. \*P < 0.05.

positive effect of the treatment 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 groups. Increased milk intake is significantly associated with increased weight of offspring (Niznikowski *et al.*, 2006). Likewise, for young lambs unable to feed solid food, breast milk is the only source of nutrients (Coulibaly, 1988) and their growth performance depends. Indeed, lambs' postnatal growth rates can be negatively affected by reduced milk production (Tygesen *et al.*, 2008).

### Serum prolactin levels

Serum prolactin levels were significantly higher in ewes of double dose and Galactin groups than control and single dose groups ( $p < 0.05$ ). It is noticed that the serum prolactin levels were comparable to the single dose and Control groups. Treatments based powder *S. mombin* stimulated serum prolactin level in treated ewes compared with the control group in a dose-dependent. The lactogenic activity displayed by the double dose of powder when compared with that Galactin showed no significant statistical difference in serum prolactin level. 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 (Mirzaei, 2012). This prolactin stimulation is substantially similar to that obtained in lactating rats treated with extracts of *Euphorbia hirta*, *Hibiscus sabdariffa* and *Secamone afzelii* (Adepo, 2010).

### 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, *Spondias mombin* can be recommended for the local sheep farmers to increase the milk production of ewes WAD in order to improve the growth of lamb. This plant can be considered as an alternative for lactogenic hormones for inducing lactation in WAD ewes.

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