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RESEARCH ARTICLE

COMPARATIVE EFFECTIVENESS OF FRESH LEAVES AND LEAVES POWDER OF SPONDIAS MOMBIN ON MILK PRODUCTION OF DJALLONKE EWES AND WEIGHT GROWTH OF THEIRS LAMBS IN SOUTHERN BENIN.

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Abstract

This study was conducted in Republic of Benin to compare the effectiveness of two forms (powder and fresh leaves) of *Spondias mombin* on the milk production of the Djallonke ewes as well as weight gains of theirs lambs. The experimental part involved 18 lactating ewes divided into three homogeneous groups of 6 animals each that received fresh leaves and powder of leaves of *Spondias mombin*. The results of experimental study showed that fresh leaves of *S. mombin* improved significantly the milk production of ewes (109.97g VS 96.30g and 103.94) and weight gain of lambs (ADG: 107.73g/day VS 58.50g/day and 85.33g/day). The powder of leaves of *S. mombin* had less effect on milk production or on the growth of lambs compared to the fresh group, but had more effect compared to the control group. Treatments based on *S. mombin* had no effect on the variation of body weight of ewes during lactation ($p>0.05$). Also, the leaves of *Spondias mombin* had no significant effect on pH, dry matter content, ash content, protein and milk fat ($p > 0.05$). The leaves of *S. mombin* can be a best source of plant drug to increase the milk production on african livestock for malnutrition reduction.

Introduction:-

Medicinal plants have long been used for the treatment of both diseases in humans and animals (Osai, 1998). Today, more than 80% of the West African population depends on traditional medicine for the treatment of illnesses (Who, 2002). With regards to the richness and diversity of the African flora, the use of herbal medicine in Africa is more than a necessity. It is an alternative to modern medicine which is sometimes expensive and inaccessible to all population groups. Among the most commonly used medicinal plants, are those with galactogenic properties. These are plants that according to Bognounou and Guinko (1979), are supposed to be able to induce and stimulate lactation or improve the quality of milk. *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-helmintic (Ademola *et al*., 2005),

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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). In Republic of Benin, ethno botanical survey of traditional healers recommends *Spondias mombin* to have lactogenic activity (Akouedegni, 2013). Igwe (2010) and Akouedegni (2012, 2013) proved lactogenic activity in the ewes treated with fresh leaves of *Spondias mombin*. This tradition of old is found almost identical to itself and no consistent application in veterinary medicine has been established to our knowledge to date.

To improve the weight gain of pre-weaning lambs, a trial was conducted to compare the effect of leaves powder and fresh leaves of *Spondias mombin* on ewes milk production and weight gain of theirs lambs.

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 Match, July to September) and two rainy.

Powder obtainment:

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 (23.5g/ewe/day) 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).

Management of animals:

The Djallonke ewes of a lambing rank of 2, body weight ranging from 16.5 ± 1.05 kg were used in this trial that lasted four months. They were regularly vaccinated against the small ruminant plague and treated against ectoparasites and gastro-intestinal strongyles. After parturition, 18 Djallonke ewes in lactation were selected and randomly divided into 3 groups of 6 animals each. During the first three days of lactation, each ewe receives the fresh leaves and the powder of leaves early in the morning before leaving for grazing.

1. **Control group:** without treatment
2. **Group Fresh:** receiving 100 g of fresh leaves of *S. mombin* per ewe for 3 days at the beginning of lactation.
3. **Group Powder:** receiving 23.5 g of powder of *S. mombin* ‘leaves per ewe for 3 days at the beginning of lactation.

The animals were conducted on artificial or improved pasture consisting of C1 *Panicum maximum*, *Brachiaria ruziziensis*, *Andropogon gayanus*, *Aeschynomene histrix* and *Cajanus cajan* from 11 AM to 17 PM (for 6h).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 hum were given to them. They also received mineral supplements in the form of licks and water *ad libitum* throughout the test 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.

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 <0.05 were regarded as statistical significance.

Results:-

Milk production:

From the first week up to the ninth week of lactation, the lactation curves (Fig 1) showed that ewes that received the fresh leaves and powder of leaves of *S. mombin* produced more milk than control group. From the ninth week to the end of lactation, the daily milk production is similar in all groups (Fig 1). This is evident on the lactation table of three groups (Table1). The daily milk production of the third week lactation was significantly higher ($p < 0.05$) in the ewes of Group Fresh and Group Powder than group Control. Likewise, these parameters were significantly higher in the fresh group than the powder group. The daily milk production of the ninth week lactation, the average daily milk production for all lactation duration, the total milk production were not different between groups Powder and fresh ($p > 0.05$). But, the average daily milk production for all lactation duration and the total milk production were significantly higher in the ewes for the fresh group compared to control group ($p < 0.05$).

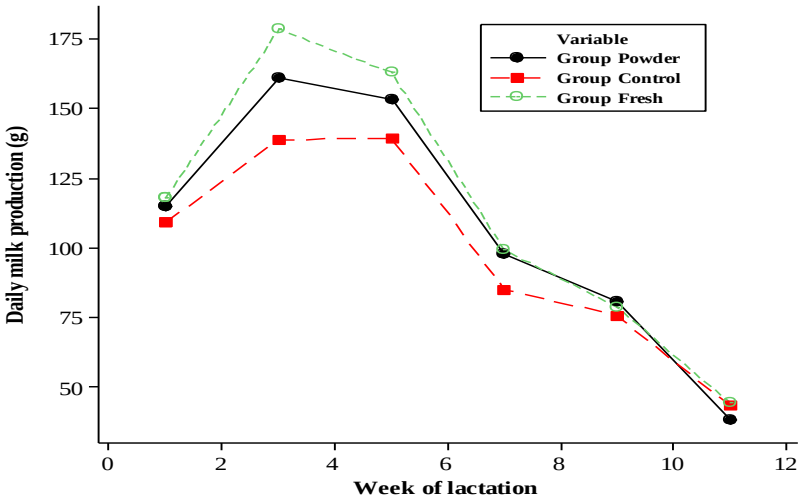


Figure 1:-Daily milk production according to week of lactation and treatment.

Table 1:-Milk production (g) according to treatments.

Parameter	Group Fresh	Group Control	Group Powder
Third week lactation (g)	181.15 ± 23.27 b	138.80 ± 17.78 a	169.02 ± 21.3 c
Ninth week lactation (g)	53.32 ± 13.62 a	48.61 ± 12.5 a	45.32 ± 24.46 a
Average Daily milk production (g)	109.97 ± 9.20 a	96.30 ± 4.45 b	103.94 ± 7.38 ab
Total milk production (g)	715.34 ± 20.91 a	650.30 ± 26.37 b	679.18 ± 20.8 ab

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

Weight performance:

The body weight of lambs increased gradually during the first half and was virtually identical in all groups (Figure 2). After the first two weeks, this increase became higher in the fresh group and powder group than the control group. The analysis of variance (Table 2) showed that average daily gain (ADG) of the lambs in 15 - 30 days, 30 - 45 days and 60 - 75 days were not different between the powder group and control group but significantly higher in the lambs for the fresh group ($p<0.05$). The ADG of the lambs in 45 - 60 days, 75 - 90 days were not different between groups. In the mean-time, The ADG of the lamb in 0 - 15 days was significantly different between all

treatments compared two and two ($p<0.05$). Also the treatments had no effect on initial and final body weight of ewe ($p> 0.05$) (Table 2).

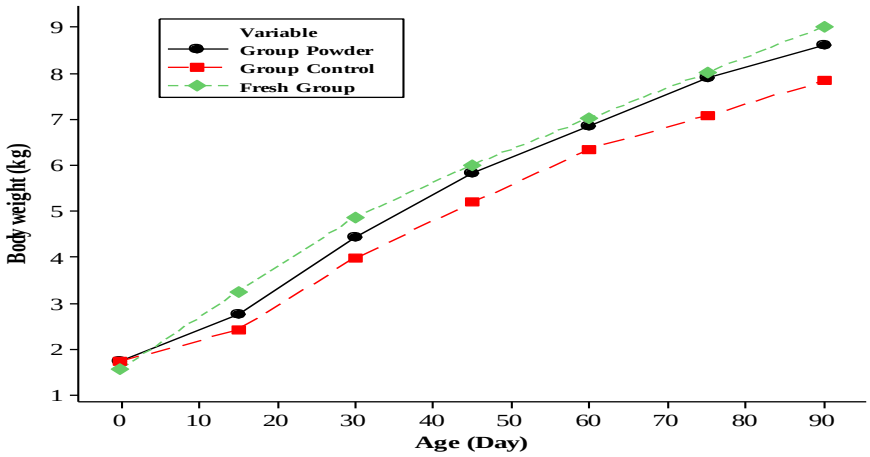
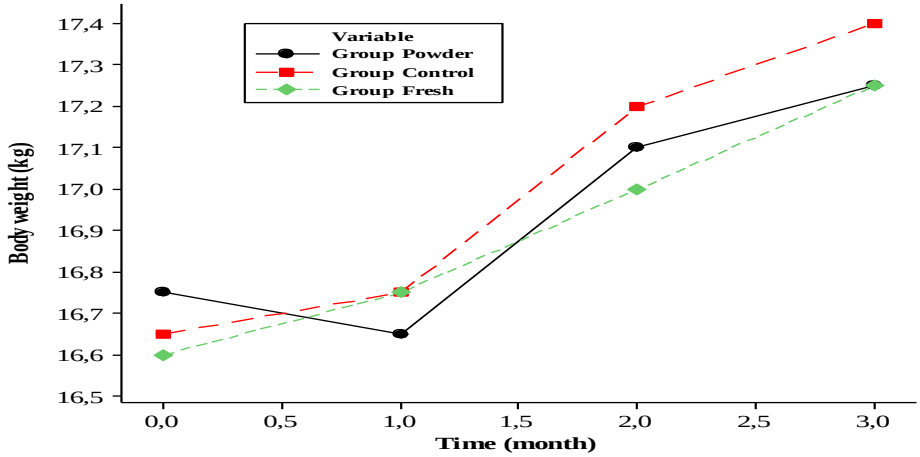


Figure 2:-Lamb body weight according to age and treatments.

Table 2:-Average Daily Gain (ADG) g/day of lambs according to the treatments

Parameters	Group Fresh	Group Control	Group Powder
ADG 0 - 15days	107.73 ± 10.81 a	58.50 ± 10.95 b	85.33 ± 9.89 c
ADG 15 - 30 days	112.67 ± 13.82 a	77.13 ± 9.83 b	94.87 ± 5.06 ab
ADG 30 - 45 days	101.33 ± 8.03 a	79.51 ± 4.44 b	87.33 ± 7.96 ab
ADG 45 - 60 days	88.86 ± 6.33 a	76.20 ± 5.83 a	81.20 ± 11.94 a
ADG 60 - 75 days	75.53 ± 2.37a	54.60 ± 13.77 b	70.66 ± 9.87 ab
ADG 75 - 90 days	53.53 ± 4.02 a	46.53 ± 5.41 a	48.86 ± 5.03 a
Ewes Body weight (kg			
First day of lactation	16.64 ± 0.75 a	16.68 ± 0,98 a	16.74 ± 0.76 a
90 days of lactation	17.32 ± 0.67 a	17.49 ± 0.89 a	17.24 ± 0.48 a

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



Milk physico-chemical composition

The pH of milk found no difference in the three groups making it statistically insignificant ($p > 0.05$) (Table 3). Regarding the chemical composition, it was noticed that the milk of ewes in control group contained less water compared to groups Fresh and Powder but without significantly difference ($p >0.05$). The ash content, protein and fat were not significantly different between the groups ($p > 0.05$) (Table 3).

Table 3:-Milk physico-chemical composition

Parameters	Group Fresh	Group Control	Group Powder
pH	6.92 ± 0.04 a	6.94 ± 0.04 a	6.92 ± 0.07a
Total Solid TS (%)	15.22 ± 0.16 a	15.57 ± 0.26 a	15.35 ± 0.29 a
Ash content (%TS)	2.03 ± 0.03 a	2.04 ± 0.05 a	2.06 ± 0.6 a
Protein (%TS)	5.17 ± 0.02 a	5.19 ± 0.05 a	5.25 ± 0.15 a
Fat (%TS)	6.23 ± 0.13 a	6.40 ± 0.15 a	6.20 ± 0.23 a

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

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. The results obtained on milk production indicate that the leaves of *Spondias mombin* significantly stimulated milk production in treated ewes compared to control group. The ewes from the Fresh group and the powder group produced more milk than ewes of other Control group. The better production of milk by the groups treated with the *Spondias mombin* could be due to the action of the lactogenic activity from the leaves of *S. mombin*. In fact, the lactogenic effect of leaves of *S. mombin* has already been tested by Akouedegni (2012, 2013) and Oguike (2008). The lactogenic activity of the leaves of *S. mombin* could be related its ability to stimulate the secretion of hormones that promote milk synthesis (Houdebine, 1986), especially the prolactin (Sawadogo, 1987). Prolactin plays a major role in the induction of milk secretion (Sawadogo, 1987) and also appears to be involved in the growth of the mammary gland. Kensinger et al. (1982) observed a positive correlation between level of the prolactin in the blood and the weight of breast tissue. The difference of milk production between fresh group and powder group could be due to nutritive composition of the leaves plant that can vary according to the leave forms.

The lambs of the groups Fresh and Powder had the best weight performance. Also, the best average daily gain was observed with these lambs compared to the Control group. This was due to the greater milk production of the ewes. Indeed, for lambs unable to take solid foods, breast milk is the only source of nutrients (Coulibaly, 1988) and their growth depends on its consumption (Abassa, 1992). This dependence for pre weaning growth of lambs on the ewe milk production was earlier reported by several authors. For example Boujenane (1996) and Amégée (1984) reported a positive correlation ($r = 0.52$ to 0.86) between milk production and lamb growth in the Djallonke sheep.
From birth to 90 days of age, ADG ranged from 46.53 to 112.67 g/day between groups. These results are similar to those of Vallerand and Branckaert (1975), Rombaut (1980) and Poivey *et al.* (1982) who noticed that the ADG of lambs are generally between 50 and 150 g/day the month following their birth. These gain fell eventually below this level and remain stable at best. Contrary to our results, N'gère (1973) reported that between 0 and 90 days, the daily gain ranged from 115 – 134 g/day for single births. This difference could be explained by several factors including the rank of lambing, the birth weight of lambs and experimental conditions.

The pH of the milk in the three groups is similar. It is noticed that the milk in the control group seems contain less water. This difference can be explained by several factors like genetic factors and the treatments Atti and Rouissi (2003). Others 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 content of milk obtained in this study is similar to the one of Adewumi and Olorunnisomo (2009): 5.17 - 5.25% in WAD ewes. Ekeocha (2012) obtained slightly higher values from fat (7.08%) and protein (6.12%) in WAD ewes. This difference could be explained by feeding regimes, ration components and forage, grain ratios that affected milk composition.

Conclusion:-

The effectiveness test of fresh leaves and powder of leaves of *Spondias mombin* on the Djallonke ewes milk production showed the positive effect of fresh leaves on milk production on the one hand and on the other hand its positive effect on the weight gains of lambs. As a matter of fact, interesting increases in milk production and body weight of lambs belonging to the fresh group that received the fresh leaves of *S. mombin* were observed with the Djallonke sheep. The powder of leaves of *S. mombin* had less effect on milk production or on the growth of lambs compared to the fresh group.

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