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**WATTLE GENE AND ITS INFLUENCE ON REPRODUCTIVE PERFORMANCE AND RECTAL TEMPERATURE IN RED SOKOTO (*MARADI*) DOES RAISED SEMI-INTENSIVELY IN MINNA, NIGER STATE, NIGERIA.**

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**ABSTRACT**

A study on the Influence of wattle gene in Red Sokoto (*Maradi*) goats on reproductive performance and rectal temperature was carried out at the Teaching and Research Farm of the Department of Animal Production, Federal University of Technology, Minna. Thirty-six (36) Red Sokoto goats comprising of thirty-two (32) does (ages between seven to eight months) and four (4) bucks (between one and half to two years of age) managed semi-intensively were used for the study. Parameters examined includes: Conception rate, Abortion Rate, Parturition, Gestation gain, Gestation length, Weight of does pre and post-partum kidding loss, Litter size, Body weight of kid(s) at birth, Mortality rate, Rate of twin/singles and Ratio of males to females, The rectal temperature, Progesterone and oestrogen profile of the does. The experiment revealed that: wattle gene had significant ( $p < 0.05$ ) influence on the reproductive performance of Red Sokoto does. Wattled does mated with wattled buck ( $T_4$ ) had the lowest weight of doe pre and post-partum. Wattled does mated with non-wattled buck ( $T_3$ ) and wattled does mated with wattled buck ( $T_4$ ) had the highest kidding loss and larger litter size. Non-wattled does mated with wattled buck ( $T_2$ ) and wattled does mated with non-wattled buck ( $T_3$ ) had the better birth weight of kids. Females mated with non wattled buck ( $T_1$ ) and ( $T_3$ ) had the highest conception rate of up to 62.5 %. Mating between the wattled and non-wattled ( $T_2$  and  $T_3$ ) had 0 % abortion. Mating between wattled does mated with wattled bucks ( $T_4$ ) had up to 50 % twins. Mating between non-wattled does mated with wattled bucks ( $T_2$ ) produced the highest number of males while mating between wattled does and wattled buck ( $T_4$ ) had the largest percentage of female kids (66.7 %).

**Keywords:** Doe; Goats; Red Sokoto; Reproductive; Wattle

**INTRODUCTION**

Wattle is the cartilaginous tissue surrounded by dense fibrous connective tissue hanging on the neck of some ruminants (Robert, 1994). In domestic goats (*Capra hircus*) wattles are regarded as congenital thumb-shaped appendages on the ventral throat. They consist of normal



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

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epidermis, dermis, subcutis, muscles, nerves, blood vessels and a central cartilage (Imagawa *et al.*, 1994). The localization and anatomical description suggest that this tissue might have a branchiogenic origin (Reber *et al.*, 2015). Wattles are occasionally reported in other species such as sheep, pigs and humans. Wattles were alternatively designated as appendices colli, cervical chondrocutaneous remnants or congenital cartilaginous rest of neck (Weissenrubler, 2000; Coras *et al.*, 2005). Goats can have zero, one or two wattles. Caprine wattles are caused by an autosomal dominant 'W' allele, and earlier studies indicate that the presence of wattles is not correlated with sex or with the presence of horns or beard (Kronacher & Ogrizek, 1924; Lush, 1926; Asdell & Buchanan-Smith, 1928). It was speculated that the expression of wattle gene in goats may represent some adaptive mechanisms related to adaptation and survival in different ecological zones (Odubote, 1994). Several research findings (Casu *et al.*, 1970; Osinowo *et al.*, 1988; Shongjia *et al.*, 1992; Ozoje, 2002; Ozoje and Mgbere, 2002) have reported some positive associations between wattle traits and livestock performances, namely; growth, reproduction and heat tolerance. Adedeji *et al.* (2011) worked on the effect of wattle on haematology in West African Dwarf goats. Information on the parameters listed above in Red Sokoto (*Maradi*) goats is scarce. This work is therefore aimed at studying the Influence of wattle on reproductive performance and rectal temperature in Red Sokoto (*Maradi*) goats.

### MATERIALS AND METHODS

#### Description of Study Area

The study was carried out at the Teaching and Research Farm of the Department of Animal Production, Federal University of Technology, Minna, Niger State, Nigeria. Minna is located within latitude 9° 37' North and longitude 6° 33' East of the equator. Minna has a mean annual rainfall of 1,300 mm, with an average highest temperature in the month of March and lowest temperature in the month of August. The mean annual temperature is between 22 and 40° C. Minna is located in the Southern Guinea Savannah vegetation belt of Nigeria and has two distinct seasons; wet from March to October and dry from November to March (Federal University of Technology, Minna, Students Handbook, 2017).

#### Source and management of the experimental animals

Thirty-six (36) Red Sokoto goats comprising of thirty-two does and four bucks were used for the experiment. The does were purchased at a fairly young age of between seven (7) to eight



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

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(8) months in order to avoid the purchase of pregnant does while males of about one and half to two years were purchased to ensure effective breeding (the ages of the goats were determined by dental examination). The animals were sourced from within Niger State, majorly from neighbouring communities (Minna, Mariga, Beji, Kanfaninbobi and Bida). The purchased goats were acclimatized to the new environment for a period of eight (8) weeks. During acclimatization, the goats were administered with Ivomectin<sup>®</sup>; a broad spectrum anti parasitic drug, to remove both internal and external parasites. Vaccination against peste des petits ruminants (PPR) was done using PPR-VAC<sup>®</sup>. Broad spectrum anti-biotic (20 % oxyteracycline: Heibei Huarun Pharmacy Co. Ltd., China), penstrep<sup>®</sup> (Kepro, Holland), envite<sup>®</sup> multi vitamin (Ventidia pharmaceutical Ltd, India), albendazole<sup>®</sup> (Jawa International Limited, Lagos, Nigeria) and other drugs were administered when necessary to keep the animals in good health. The pen was constructed from wood and metal sheets. Water were provided *ad-libitum*, feed (yam peels, maize offal, beans husk and sorghum chaff) were given around 9.00 am every morning at the rate of 10 kg per treatment before the animals were released for grazing. The proximate composition of feeds given to the goats is shown in Table 1

### **Treatments and Experimental Design**

The thirty-two does and four bucks were allotted to four treatments in a Completely Randomised Design (CRD). Treatment one (**T<sub>1</sub>**) comprised of goats without wattles in both sexes (serving as the control). Treatment two (**T<sub>2</sub>**) comprised of does without wattle mated with wattled bucks. Treatment three (**T<sub>3</sub>**) comprised of wattled does mated with non-wattled bucks while Treatment four (**T<sub>4</sub>**), comprised of wattled does and bucks. Each treatment having eight replicates with each replicate containing one doe. The four bucks were divided among the four treatment groups (one buck per treatment) and were kept separately from the does. The animals were tagged properly for identification. Bucks were confined before mating to prevent unwanted breeding.



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

**Table 1: Proximate composition (%) and energy level (Kcal) of the yam peel, maize offal, beans husk and sorghum charf fed to the goats**

Parameters	Yam peel	Maize offal	Beans husk	Sorghum charf
Dry matter	91.09	86.05	87.58	89.28
Crude protein	7.87	14.87	8.75	6.12
Crude fibre	11.70	13.10	32.45	32.90
Ether extract	1.70	2.20	1.60	5.88
Ash	4.80	0.95	8.51	4.21
Nitrogen Free Extract	65.02	54.93	36.27	40.17
Metabolizable Energy	307.66	299.09	194.48	238.08

### Data Collection

#### Commencement of the Experiment

This experiment began after the does and bucks were allotted to their various treatments. Oestrous was synchronized with the use of oil oestradiol at the rate of 2 ml per doe. This is to ensure that the does come on heat at about the same time. This also ensures that the does become pregnant at about the same time and also, kidded at about the same time. This made record keeping easy, and ensured that kids born are exposed to the same management practices and the same climatic regime. Does on heat were taken to the male pen of their treatment group for mating. Mating was repeated three weeks after the first mating as a means of checking if pregnancy had resulted after the first mating.

Data were collected on the gestation length, gestation gain, kidding loss, weight of does pre partum, weight of does post-partum, conception rate, rate of abortion/miscarriage, number of kid(s) at birth, birth weight of kid(s), sex ratio, survival and mortality rate of kids in each treatment group. Blood serums were collected from the does for hormonal assay (progesterone and oestrogen). The goats were sufficiently calmed before blood samples were collected. Necessary precautions were taken in order not to pierce the lung tube with the needle (22-gauge needle). Once the jugular vein was located, a thumb was used to press the lower part of the vein to prevent blood from flowing. 5 ml of blood samples were collected from the does by jugular venipuncture and was dispensed into plain (anticoagulant free) bottles and were also labeled properly. The blood samples were collected before the does were mated, during the five month of pregnancy and a week after the does kidded. The progesterone and oestrogen in



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

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the serum were analysed at the Biotechnology Centre, Federal University of Technology, Minna, using Accubind Elisa microwells kits (ISO 13485 and 9001, Monobind Inc, USA). The rectal temperatures of does were taken using a digital thermometer (Hicks thermometers, Model DT-101, India).

### Parameters Measured

**Gestation length:** This was achieved by counting in days from the day does were mated to the day they kidded.

**Gestation gain:** This was measured in kg using a 50 kg capacity spring balance (Raj Engineering Industries, India) and was calculated by subtracting the weight of doe(s) at mating from their weight one-day pre-partum/before birth.

**Kidding loss:** This was measured in kg using 50 kg spring balance and was taken as the difference between doe's weight a day before kidding and its weight a day post-partum.

**Weight of doe pre-partum:** This was measured using a 50 kg spring balance and taken as the weight of does a day before parturition.

**Weight of doe post-partum:** This was measured using a 50 kg spring balance and taken as the weight of does immediately after parturition.

**Conception rate:** This was evaluated using the formula:

$$\frac{\text{Number of pregnant does}}{\text{Total number of does mated}} \times 100$$

**Abortion rate/miscarriage:** This was measured using the formula

$$\frac{\text{Number of pregnancies that ended before kidding}}{\text{Total number of does that kidded}} \times 100$$

**Number of kids weaned:** This was the number of kids at birth and was obtained by counting.

**Body weight of kid(s):** The body weight of each kid at birth was taken in kg using a 5 kg capacity kitchen weighing scale.

**Sex ratio:** This was obtained by counting, and was taken as the ratio of male to female kids in each treatment.

**Survival rate:** This was calculated using the formula:

$$\frac{\text{Number of kids alive when assessing the kids}}{\text{Total number of kids born}} \times 100$$



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

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**Neo-natal mortality rate:** This was calculated using the formula:

$$\frac{\text{Number of dead when assessing the kids} \times 100}{\text{Total number of kids born}}$$

### Data Analysis

Data collected were analyzed using SAS statistical package (SAS, 2000). Means were separated using Duncan Multiple Range Test.

## RESULTS

### Reproductive Traits of Red Sokoto does raised Semi Intensively as Influenced by Wattle Gene

The effect of wattle gene on the reproductive traits of Red Sokoto does is presented in Table 2. Significant ( $p < 0.05$ ) effect of wattle was observed in all the traits except gestation gain and gestation length. Weight of does pre partum was significantly ( $p < 0.05$ ) higher in non-wattled does mated by wattled bucks (19.40) while the lowest value was observed in T<sub>4</sub> (wattled does mated by wattled bucks with 17.00 kg). Wattle to wattle mating (T<sub>4</sub>) also had significantly ( $p < 0.05$ ) lowest weight of does post-partum (14.75). Kidding loss and litter size followed a similar trend; wattled does mated with wattle buck in T<sub>4</sub> had significantly ( $p < 0.05$ ) higher values over T<sub>1</sub> and T<sub>2</sub> but were statistically similar ( $p > 0.05$ ) to the result obtained from wattled does mated with non-wattled bucks in T<sub>3</sub>. Non-wattled does mated with non-wattled bucks (T<sub>1</sub>) and non-wattled does mated with wattled bucks (T<sub>2</sub>) however, had the least values but had statistically similar values ( $p > 0.05$ ) with does in T<sub>3</sub>. The birth weight of kids in T<sub>2</sub> and T<sub>3</sub> were higher ( $p < 0.05$ ) than in T<sub>1</sub> and T<sub>4</sub>.

T<sub>1</sub> and T<sub>3</sub> had significantly ( $p < 0.05$ ) higher conception rate of 62.5 % followed by T<sub>2</sub> (50 %), T<sub>4</sub> had the least conception rate (25 %). Goats in T<sub>4</sub> had the highest ( $p < 0.05$ ) number of does that failed to conceive (75 %) followed by does in T<sub>2</sub> (50 %). T<sub>1</sub> and T<sub>3</sub> had significantly ( $p < 0.05$ ) the least (37.5 %) conception rate. Does in T<sub>4</sub> had significantly ( $p < 0.05$ ) the highest abortion rate (50 %) followed by (T<sub>1</sub>) (20 %) while T<sub>2</sub> and T<sub>3</sub> had significantly ( $p < 0.05$ ) the least abortion rate (0 %). Does in T<sub>2</sub> and T<sub>3</sub> had 100 % ( $p < 0.05$ ) parturition while does in T<sub>1</sub> and T<sub>4</sub> had up to 80 % and 50 % parturition rate, respectively. Kids in T<sub>2</sub> had significantly ( $p < 0.05$ ) higher survival rate (100 %) followed by kids in T<sub>1</sub> with 75 % survival rate; T<sub>3</sub> had 66.7 % while T<sub>4</sub> had 33.3 % survival rate. T<sub>4</sub> had significantly ( $p < 0.05$ ) higher mortality rate



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

(66.7 %), followed by T<sub>3</sub> (33.3 %), T<sub>1</sub> (25 %) and T<sub>2</sub> (0 %), respectively. Mating between wattled does and wattled buck in T<sub>4</sub> yielded more ( $p < 0.05$ ) twins (50 %) than wattled does and non-wattled bucks in T<sub>3</sub> (25 %), non-wattled doe and non-wattled bucks in T<sub>1</sub> (0 %) and between non-wattled does and wattled buck in T<sub>2</sub> (0 %). T<sub>2</sub> had the highest ( $p < 0.05$ ) percentage of males (75 %), followed by T<sub>1</sub> and T<sub>3</sub> (50 %) while T<sub>4</sub> (25 %) had the least. T<sub>4</sub> had significantly ( $p < 0.05$ ) larger proportion of females (66.7%) followed by T<sub>1</sub> and T<sub>3</sub> (50 %), T<sub>2</sub> had the least female population (25 %).

### **Rectal Temperature of the Red Sokoto does raised Semi Intensively as Influence by Wattle Gene**

The effect of wattle gene on the rectal temperature (°C) of the Red Sokoto does raised semi-intensively is presented in Table 3. The result showed significant ( $p < 0.05$ ) difference in average rectal temperature before mating in first and second months only. The average rectal temperature for the third, fourth and fifth months and the mean showed no significant ( $p > 0.05$ ) difference. The average rectal temperature of does in T<sub>4</sub> was observed to be significantly ( $p < 0.05$ ) higher than in does found in T<sub>1</sub> (39.30). T<sub>2</sub> (39.10) and T<sub>3</sub> (38.98) who were statistically similar before mating. In the first month of gestation, does in T<sub>2</sub> (39.28) had significantly ( $p < 0.05$ ) higher average rectal temperature than those in T<sub>1</sub> (38.93). Does in T<sub>3</sub> (39.10) and T<sub>4</sub> (39.15) had intermediate values ( $p > 0.05$ ) between the extremes. The highest ( $p < 0.05$ ) average rectal temperature in the second month of gestation was found in T<sub>1</sub> does (38.92) and the least ( $p < 0.05$ ) was found in T<sub>2</sub> does (38.63). T<sub>3</sub> and T<sub>4</sub> does also had intermediate values as in the first month of gestation. (38.88 and 38.85 respectively)

### **Pattern of Progesterone Levels of does raised Semi Intensively, before Mating, during Pregnancy and after Kidding**

The pattern of progesterone (ng/ml) levels of wattled and non-wattled Red Sokoto does raised semi intensively, before mating, during pregnancy and after kidding, are shown in Figure 1. The serum progesterone of does before mating revealed no significant ( $p > 0.05$ ) difference among the treatment groups. The progesterone levels during the first five months of pregnancy and the first month after birth however, revealed significant ( $p > 0.05$ ) differences. The figure showed that T<sub>1</sub> (11.64 ng/ml) T<sub>2</sub> (10.93 ng/ml) and T<sub>3</sub> (10.23 ng/ml) had the highest ( $p < 0.05$ )



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

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progesterone level while T<sub>4</sub> (9.15 ng/ml) had the least ( $p>0.05$ ) in the first month of pregnancy. Does in T<sub>1</sub>, T<sub>2</sub> and T<sub>4</sub> had the higher ( $p<0.05$ ) progesterone levels of 17.85, 16.91 and 16.25 ng/ml, respectively, over T<sub>3</sub> (15.01ng/ml) with the least in the second month of pregnancy. In the third and fourth months of pregnancy, the progesterone levels followed a similar trend with does in, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> having statistically ( $p<0.05$ ) the highest progesterone levels, T<sub>1</sub> had significantly ( $p<0.05$ ) the least progesterone levels in the fifth month of pregnancy. Does in T<sub>2</sub> and T<sub>3</sub> had a statistically higher ( $p<0.05$ ) progesterone level followed by those in T<sub>4</sub> and T<sub>1</sub>, respectively after parturition.

### **Pattern of Oestrogen Levels of does raised Semi Intensively, before Mating, during Pregnancy and after Kidding**

The pattern of the mean oestrogen (pg/ml) levels of wattled and non-wattled Red Sokoto does raised semi intensively, before mating, during pregnancy and after kidding (Figure 2) revealed that wattle had significant ( $p<0.05$ ) influence on the pattern of oestrogen before mating, during five month of pregnancy and after kidding. Before mating, the estrogen levels in T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> (12.50, 10.25 and 9.80 pg/ml) were higher ( $p<0.05$ ) while T<sub>4</sub> (8.20 pg/ml) had the lowest but which is similar ( $p>0.05$ ) to T<sub>2</sub> and T<sub>3</sub>. In the first month of pregnancy, T<sub>2</sub> (132.90 pg/ml) had significantly ( $p<0.05$ ) higher oestrogen followed by T<sub>3</sub> (128.97 pg/ml), T<sub>4</sub> (118.74 pg/ml) and T<sub>1</sub> (92.50 pg/ml). In the second month of pregnancy, does in T<sub>3</sub> (265.80 pg/ml) had significantly ( $p<0.05$ ) higher levels of oestrogen, followed by does in T<sub>2</sub> (262.70 pg/ml), T<sub>4</sub> (259, 50 pg/ml) and T<sub>1</sub> (253.67 pg/ml), respectively. Does in T<sub>2</sub> (525.33 pg/ml) had the highest ( $p<0.05$ ) oestrogen level followed by those in T<sub>4</sub> (451.00 pg/ml), T<sub>1</sub> (402.67 pg/ml) and T<sub>3</sub> (331.67 pg/ml) in the third month of pregnancy. Does in T<sub>1</sub> (638.75 pg/ml) and T<sub>2</sub> (636.33 pg/ml) had ( $p<0.05$ ) higher levels of oestrogen than T<sub>3</sub> (628.00 pg/ml) and T<sub>4</sub> (633.00), respectively in the fourth month of pregnancy. In the fifth month, T<sub>2</sub> (885.67 pg/ml) and T<sub>3</sub> (879.67 pg/ml) does had statistically ( $p<0.05$ ) higher oestrogen levels than T<sub>1</sub> (808.67 pg/ml) and T<sub>4</sub> (812.00 pg/ml) does. After parturition, does in T<sub>1</sub> (9.86 pg/ml) had the highest ( $p<0.05$ ) oestrogen level compared to those in T<sub>2</sub> (7.27 pg/ml), T<sub>3</sub> (6.76 pg/ml) and T<sub>4</sub> (5.66 pg/ml), respectively.



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

**Table 2: Reproductive traits of Red Sokoto does raised semi intensively as influenced by wattle gene**

Parameters	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	SEM
Conception rate (%)	62.50 <sup>a</sup>	50.00 <sup>b</sup>	62.50 <sup>a</sup>	25.00 <sup>c</sup>	4.62
Failed conception (%)	37.50 <sup>c</sup>	50.00 <sup>b</sup>	37.50 <sup>c</sup>	75.00 <sup>a</sup>	4.62
Abortion (%)	20.00 <sup>b</sup>	0.00 <sup>c</sup>	0.00 <sup>c</sup>	50.00 <sup>a</sup>	6.17
Parturition (%)	80.00 <sup>b</sup>	100.00 <sup>a</sup>	100.00 <sup>a</sup>	50.00 <sup>c</sup>	10.22
Gestation length (days)	147.33	146.83	147.83	147.50	0.44
Weight of does pre partum (kg)	18.75 <sup>ab</sup>	19.40 <sup>a</sup>	18.60 <sup>ab</sup>	17.00 <sup>b</sup>	0.33
Weight of does post-partum (kg)	17.00 <sup>a</sup>	17.50 <sup>a</sup>	16.50 <sup>a</sup>	14.75 <sup>b</sup>	0.32
Gestation gain (kg)	5.75	6.64	6.60	5.50	0.26
Kidding loss (kg)	1.75 <sup>b</sup>	1.88 <sup>b</sup>	2.16 <sup>ab</sup>	2.50 <sup>a</sup>	0.11
Litter size/number of kids	1.00 <sup>b</sup>	1.00 <sup>b</sup>	1.20 <sup>ab</sup>	1.50 <sup>a</sup>	0.08
Birth weight of kids (kg)	1.50 <sup>bc</sup>	1.84 <sup>a</sup>	1.70 <sup>ab</sup>	1.27 <sup>c</sup>	0.08
Neo-natal Mortality rate (%)	25.00 <sup>c</sup>	0.00 <sup>d</sup>	33.30 <sup>b</sup>	66.7 <sup>a</sup>	7.20
Single (%)	100.00 <sup>a</sup>	100.00 <sup>a</sup>	75.00 <sup>b</sup>	50.00 <sup>c</sup>	6.25
Twin (%)	0.00 <sup>c</sup>	0.00 <sup>c</sup>	25.00 <sup>b</sup>	50.00 <sup>a</sup>	6.25
Male (%)	50.00 <sup>b</sup>	75.00 <sup>a</sup>	50.00 <sup>b</sup>	33.33 <sup>c</sup>	4.49
Female (%)	50.00 <sup>b</sup>	25.00 <sup>c</sup>	50.00 <sup>b</sup>	66.70 <sup>a</sup>	38.03

<sup>abcd</sup> Means within a row having different superscripts differed significantly ( $p < 0.05$ );

**T<sub>1</sub>**= Non-wattled does mated with non-wattled bucks;

**T<sub>2</sub>** = Non-wattled does mated with wattled bucks;

**T<sub>3</sub>**= Wattled does mated with non-wattled buck;

**T<sub>4</sub>**= Wattled does mated with wattled bucks.

**SEM**= Standard error of mean



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

**Table 3: Rectal temperature of the Red Sokoto does raised semi-intensively as influence by wattle gene**

Average rectal temperature (°C)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	SEM	Normal range 38.5-39.7 (°C) *
Before mating	38.50 <sup>b</sup>	39.10 <sup>b</sup>	38.98 <sup>b</sup>	39.30 <sup>a</sup>	0.12	39.44 (April, 2017)
First month	38.93 <sup>b</sup>	39.28 <sup>a</sup>	39.10 <sup>ab</sup>	39.15 <sup>ab</sup>	0.05	33.31 (May, 2017)
Second month	38.92 <sup>a</sup>	38.63 <sup>b</sup>	38.88 <sup>ab</sup>	38.85 <sup>ab</sup>	0.05	32.11 (June, 2017)
Third month	39.08	39.00	39.20	39.07	0.04	29.98 (July, 2017)
Fourth month	38.88	38.77	38.90	38.78	0.05	31.8 (August, 2017)
Fifth month	38.40	38.10	38.20	38.23	0.11	29.55 (September, 2017)
After birth	38.50	38.20	38.15	38.53	0.09	33.26 (October, 2017)
Mean	38.74	38.73	38.77	38.84	0.07	32.78 (April-October, 2017)

Merck manual, 2018

<sup>abcd</sup> Means within a row having different superscripts differed significantly ( $p < 0.05$ );

**T<sub>1</sub>**= Non-wattled does mated with non-wattled bucks;

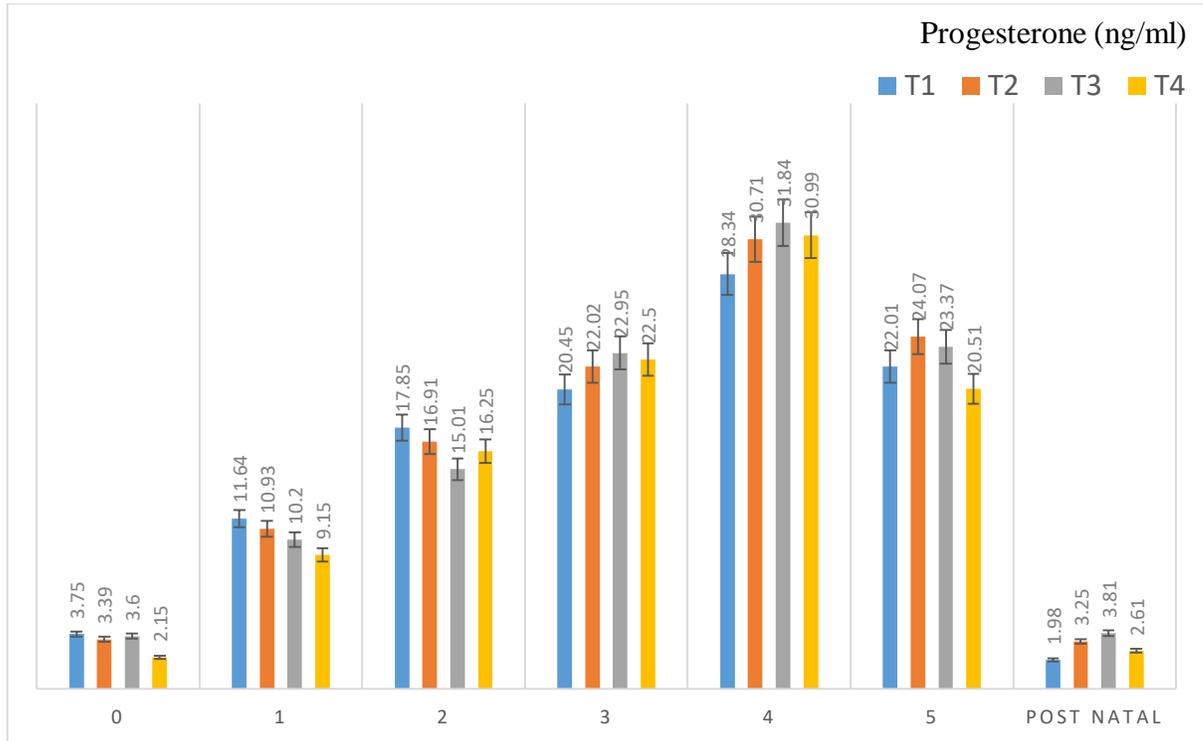
**T<sub>2</sub>** = Non-wattled does mated with wattled bucks;

**T<sub>3</sub>**= Wattled does mated with non-wattled buck;

**T<sub>4</sub>**= Wattled does mated with wattled bucks.

**SEM**= Standard error of mean

\*Average temperature of the experimental Site (Geography Department) Federal University of Technology , Minna)



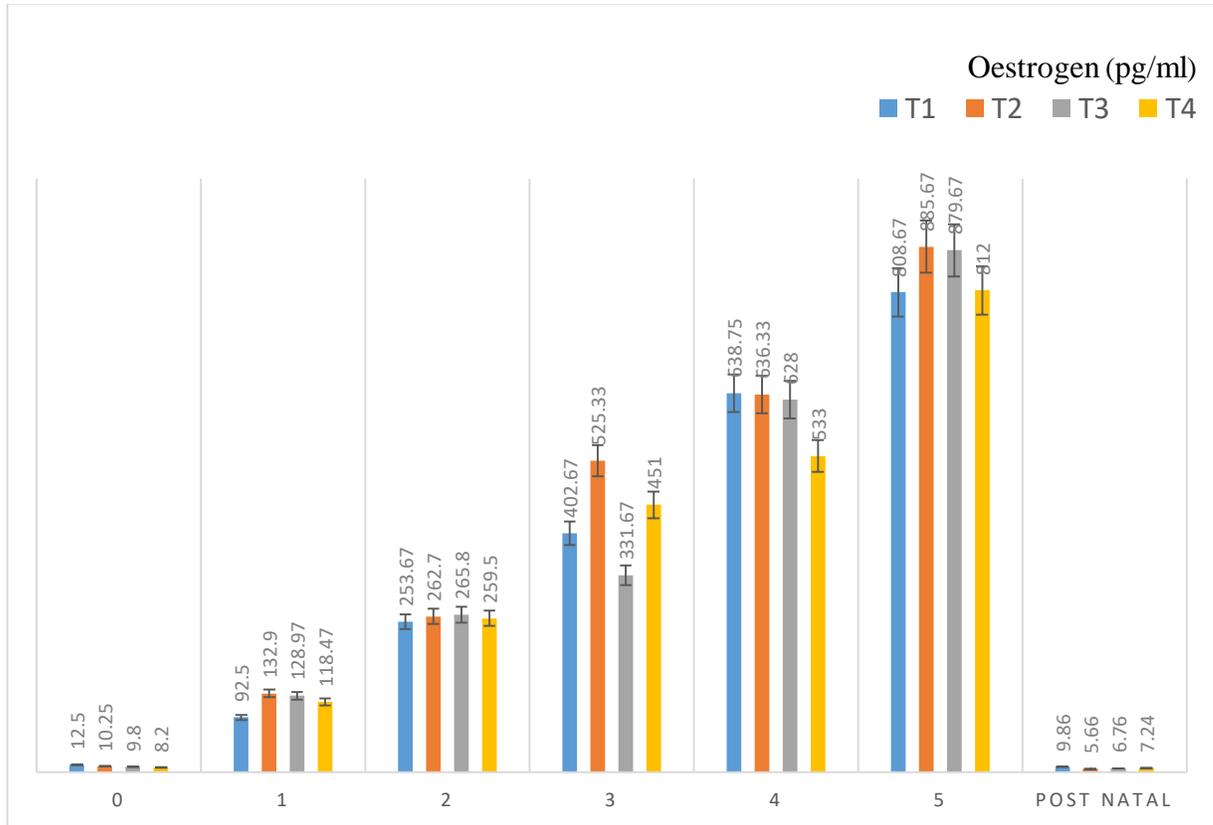
**Figure 1: Pattern of progesterone levels of does raised semi intensively, before mating, during pregnancy and after kidding**

**T<sub>1</sub>**= Non-wattled does mated with non-wattled bucks;

**T<sub>2</sub>** = Non-wattled does mated with wattled bucks;

**T<sub>3</sub>**= Wattled does mated with non-wattled buck;

**T<sub>4</sub>**= Wattled does mated with wattled bucks.



**Figure 2: Pattern of oestrogen levels of does raised Semi intensively, before mating, during pregnancy and after kidding**

**T<sub>1</sub>**= Non-wattled does mated with non-wattled bucks;

**T<sub>2</sub>** = Non-wattled does mated with wattled bucks;

**T<sub>3</sub>**= Wattled does mated with non-wattled buck;

**T<sub>4</sub>**= Wattled does mated with wattled bucks.

## DISCUSSION

The weight of does pre partum appeared to have been affected by the sex of the foetus (Table 2). Does where over 50 % of the foetuses resulted in male kids had heavier body weight pre and post-partum. Jones (2014) studied 68 million human births over the period of 23 years and found that the less weight a mother gains during pregnancy, the less likely she is to have



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

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a male. The results obtained by Soundararajan and Sivakumar (2011) suggested that male kids weighed heavier at birth because male foetus grows faster during prenatal development than female foetus. Chandra *et al.* (2009) reported that male foetuses grow faster than female foetus because of the anabolic effect of male hormones. Dovey (2014) stated that males grow faster from conception; this however puts them at a higher risk of lacking nutrients. If the female (mother) do not gain adequate amount of weight to support male foetus during pregnancy, there is bound to be a foetal loss (Jones, 2014).

The heavier weight of does post-partum confirms that the weight of does before parturition could have been influenced by the sex of the foetuses. The development of larger body size or heavier body weight is a mechanism developed by females during pregnancy to support the growth and development of male foetus which happen to be very demanding nutritionally and could die if their nutritional needs are not met (Dovey, 2014).

The birth weight of the kids falls within the range given by Osuhor *et al.* (2002); Oni (2003); Alaku (2010) and Garba *et al.* (2015) except for where 50 % of the kids were twins. The results obtained for birth weight could be due to any of three possible reasons the first being that 75 % of the kids are males, second reason is the 0 % twin obtained and thirdly, it may be because of the cross between the non-wattled does and the wattled bucks. This result is in line with the findings of Adama and Arowolo (2002); Hamayun *et al.* (2006); Alaku (2010); Soundararajan and Sivakumar (2011); Alkire (2012); Singh *et al.*, (2013); Meza-Herrera *et al.* (2014); Garba *et al.* (2015); Future beef (2018); Ganesh *et al.* (2018); and Gikunju *et al.* (2018) who studied the effect of sex, type of birth and cross breed in goat (kids). The result obtained for the kidding loss most especially in T<sub>4</sub> (wattled does mated with wattled bucks) and T<sub>3</sub> (wattled does mated with non-wattled bucks) appeared to have been affected by the litter size, although no material was found to support this ascertainment.



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

---

The conception rate appeared to have been affected by the rectal temperature of does before mating. Non-wattled does mated with non-wattled bucks, non-wattled does mated with wattled bucks (T<sub>2</sub>) and wattle does mated with non-wattled bucks which had lower rectal temperature before mating had up to 50 % conception rate compared to wattled does mated to wattled bucks (T<sub>4</sub>) that had 25 % conception rate. The results agree with the findings of Turner (2010) who observed a reduction in calving rate due to a 1°C increment in temperature in both British-breed and in Zebu-cross herds. The results obtained by Zakari *et al.* (2013) also indicates that elevated rectal temperature, mean maximum and minimum temperatures were detrimental to conception.

Abortion was observed in non-wattled does mated with non-wattled bucks and wattled does mated with wattled bucks with the highest (up to 50 %). The foetal losses or abortion rate observed in T<sub>4</sub>, is higher than the 40 % embryonic and foetal losses reported by Fonseca *et al.* (2005) for tropical environment. This could be due to harsh environmental temperature and humidity which tend to increase the thermal stress of pregnant does. This is true for this experiment, as the mean rectal temperature taken for the period of the pregnancy revealed that does in T<sub>4</sub> (wattled does mated with wattled bucks) had the highest rectal temperature. The result obtained in this work however contradicts the earlier speculations of Odubote (1994) that the presence of wattle in goats could be for thermoregulation, as goats, in spite of possessing wattle, could not properly regulate their body temperature as evidence by their higher rectal temperature.

The survival rate of kids (kids resulting from wattled does mated with wattled bucks) was lower than all the other treatments possibly because of the higher number of twins in the treatment. Twinning probably had an effect on birth weight also. Malik *et al.* (1990) found a significant litter size effect on mortality, and attributed this to a lower body weight due to



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

---

multiple birth. Perez-Razo *et al.* (1998) stated that kids weighing more than 3 kg at birth had higher survival than those weighing 2 kg or less.

The rectal temperature of the does before mating in all the treatments fell within the range (38.5-39.7 °C) given by Merck Manual. The result favoured all the does irrespective of the mating partners. The result confirms the report of Ozoje (2002) who stated that wattle gives no advantage to goats. This result however does not agree with the suggestions of Odubote (1994) that the possession of wattle in goats could be for thermoregulatory function which help the animal adapt to the environment as all the animals had similar mean rectal temperatures. Adedeji (2012) observed that West African Dwarf (WAD) goats with wattle had significantly lower rectal temperature and pulse rate than non-wattled goats; thus, it is expected that goats with wattle will adapt better to their environment than those without wattle. The lower rectal temperature (non-wattled does mated with non-wattled bucks) before mating and the first month after mating may be the reason for the high conception rate of the does in the treatment.

The progesterone levels rapidly increased across the treatments a month after mating, this is due to pregnancy which usually leads to elevation in blood progesterone level. The result is similar with the findings of Tsutomu *et al.* (1994) who observed an increase in plasma progesterone level after mating. Although the result from this current study showed irregular pattern across the treatments, continuous increased in progesterone level was observed as the pregnancy proceeded until the fourth month after which there was a marked decrease in the level of serum progesterone in the fifth month. The pattern obtained in this work is similar to the pattern obtained by Katongole and Gombe (1984) in indigenous goats of Uganda where the plasma progesterone was observed to increase until the fourth month, but decreased in the fifth month of pregnancy. Tsutomu *et al.* (1994) also reported an increase in the plasma progesterone from the day 10 to day 140 after mating. The serum progesterone of does used



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

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in this work decreased rapidly after birth. This also agrees with the findings of Katongole and Gombe (1984) and Tsutomu *et al.* (1994) who observed a rapid fall in the plasma progesterone level after does kidded; similar patterns from mating to after kidding or lambing was also observed in the serum progesterone of sheep and goats in Iraq by Alwan *et al.* (2010). The conception rate of the does in the study appeared to have been affected by the level of progesterone before mating because (non-wattle does mated with non wattle bucks) and (wattled does mated with non wattle bucks) had higher progesterone level before mating than other treatments. This agrees with the findings of Pobby (2015) and Baby2see.com, (2018) who stated that levels of progesterone affects fertility and implantation of babies. They also stated that many females with infertility or implantation failures or miscarriages produce low levels of progesterone and need supplementation.

The decline in the level of serum progesterone in the fifth month in the does, may the does way of preparing for the birth of the kids since higher levels of progesterone help to maintain pregnancy (Pobby, 2015). A critical look at the result reveals that (wattled does mated with wattled bucks) and (non-wattled does mated with non-wattled bucks) had lower progesterone levels on the fifth month; this could be the reason for the higher levels of abortions in the two treatments, with having the highest since 50 % of the pregnancy resulted in twins. Baby2see.com (2018) stated that higher levels of progesterone is needed during pregnancies involving twin or triplets. The low level of progesterone might have resulted from the conditions associated with the weather or pneumonia observed during the study, which resulted in many of the abortions. Pobby (2015) however, opined that the birth of a healthy child is still possible despite low progesterone levels. Hartwig *et al.* (2013) associated lower levels of maternal progesterone in early stages of pregnancy with reduced birth weight observed in female kids. In sheep, low progesterone levels have also been associated with low lamb birth weight (Wallace *et al.*, 1997 as cited by Hartwig *et al.* (2013). Their conclusion



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

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agrees with the findings of this work, since (wattled does mated with wattled bucks) that had low birth weight, also had lower progesterone in the early stages of pregnancy.

The maternal oestrogen levels showed a steady increase in all the treatments from the first month after mating up to the fifth month and then declined rapidly after parturition. This agrees with the findings of Alwan *et al.* (2010) who reported a similar trend in their research study. The rapid decline in oestrogen is to trigger the production of prolactin, the hormone responsible for milk production (Lee, 2019). A critical look at Figure 2 reveals that (non-wattled does mated with wattled bucks) and (wattled does mated with non-wattled bucks) had the highest oestrogen level at the fifth month. Wikipedia (2019) stated that breasts are a manifestation of higher levels of oestrogen in females. Lee (2019) opined that high oestrogen levels during pregnancy promotes the development of milk ducts in the breast. The level of oestrogen in the treatments before parturition (fifth month) could be responsible for the udder circumference and quantity of milk produced throughout the twelve weeks of the experiment since oestrogen is responsible for the development of female secondary sexual characters. Maternal hormones during pregnancy has become a useful tool for predicting the sex of the child. This may not be true for this work since (wattled does mated with wattled bucks) with the largest percentage of females at no point had higher levels of oestrogen during the period of the experiment.

### CONCLUSION

Wattle had significant ( $p < 0.05$ ) influence on the reproductive performance of Red Sokoto does. Wattled does mated with wattled buck ( $T_4$ ) had the lowest weight of doe pre and post-partum and highest kidding loss and least in birth weight. Wattled does produced higher litter size (upto 50 % twins). Females mated with non wattled bucks ( $T_1$ ) and ( $T_3$ ) had the highest conception rate of up to 62.5 %. Mating between the wattled and non-wattled ( $T_2$  and  $T_3$ ) had



## Lapai Journal of Science and Technology, Vol. 9, No. 1 (2023)

---

0 % abortion. Mating between non-wattled does mated with wattled bucks ( $T_2$ ) produced the highest number of males (up to 75 %) while mating between wattled does mated with wattled bucks ( $T_4$ ) had the largest percentage of female kids (66.7 %).

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