EFFECTS OF GRADED LEVELS OF DIOSCOREA VILLOSA EXTRACTS ON
PHYSIOLOGICAL RESPONSE OF WEST AFRICAN DWARF GOAT.

1Okukpe K. M.*, 1Adeloye A. A., 2Soladoye A. O., 3Adua M. M., 1Aderibigbe T.A. and 1Opowoye I. O.
1Reproductive Physiology Unit, Department of Animal Production, Faculty of Agriculture, University of Ilorin; 2Department of Physiology, College of Medicine, University of Ilorin, P.M.B. 1515, Ilorin, Kwara State, Nigeria; 3Department of Animal Science, Nasarawa State University, Keffi, Nasarawa State, Nigeria.

Corresponding author: - okukpekehinde@yahoo.com

Thirty (30) West African dwarf bucks aged 12 to 24months were used in an experimental design to assess the effect of Dioscorea villosa extract on the sexual response of the West African Dwarf bucks. They were subcutaneously administered 0.01, 0.02, 0.03ml/kg body weights of Dioscorea villosa extract. The control and standard group were given 0.01ml/kg body weights of normal saline and sildenafil citrate solution respectively.

The study indicates that subcutaneous administration of 0.01ml/kg of Dioscorea villosa extract increase sexual drive (libido) in WAD bucks. Animals in Group C, treated with 0.01ml/kg of Dioscorea villosa extract showed signs of active sexual activity (aggressiveness) and mounting which reduce with additional increase in extract administration. There was also significant improvement in sperm count at this dosage. This corresponds with the decreasing serum testosterone level as the extract dose was increased. Thus, the aphrodisiac activity of the extract might be attributed to its balancing of endogenous hormone in the animal and enhancement of the haemopoietic system.

Phytochemical studies indicate the presence of high levels of saponin, alkaloids and minimal flavonoid along with oxalate and phytates in the extract. Hence, the sexual function improving effect of the extract might be due to the presence of such compounds.

**Keywords:** Dioscorea villosa, extracts, West-African Dwarf goats, Libido, Subcutaneous.
alleviate pains endured during child-birth (Brinker, 1997; Mckee, 2008). Its contraceptive use is attributed to the action of various steroidal saponins (diosgenin and aglycone) and also to dioscorine, dioscine and other alkaloids derived from nicotinic acid. Diosgenin is structurally close to the female hormone, progesterone and has been used to manufacture the first ever oral contraceptive to prevent unwanted pregnancy. In addition, extracts from D. villosa has been used as an alternate for oestrogen cream that facilitates neutralizing vaginal dryness in women (Brinker, 1997; Mcerman, 1998; Cech, 2000). Marker (1940) described methods for conversion of diosgenin into testosterone and other steroids. Six saponins have been reported for D. villosa: protodioscin, ME protodioscin, parrisaponin, dioscin, progenin III (prosapogenin A of dioscin) and progenin II (Sautour et al., 2006; 2007; Hayes et al., 2007; Hu et al., 2007). The major saponin activity is that of dioscin and diosgenin. Despite the fact that the molecule can be converted to hormones such as progesterone and dehydroepiandrosterone(DHEA) by several enzymatic steps in the laboratory, there is conflicting attempts to market it as such have been dubbed by some as “the wild yam scam”(Higdon et al., 2000; Foster and Johnson, 2006). However, oestrogenic action on the mammary epithelium of ovariectomized mice has been reported (Aradhana et al., 1992) while other studies have provided mixed results (Zava et al., 1998). Diosgenin was reported to protect rat kidneys from morphological changes associated with ovariectomy, posited as occurring due to the conversion of diosgenin to progesterone in- vivo (Tucci and Benguzzi, 2003). However, any direct hormonal effect that could be attributed to D. villosa is reported to be oestrogenic (Morgan, 2011). Administration of diosgenin containing edible yam (D. alata) to postmenopausal women as 30% of their diet for 30days was reported to cause increase in serum oestrogen with a concurrent reduction in serum androgen levels(Wu et al., 2005).

The physiological enhancing and reproductive health assisting capability of the above plant is the thrust of this study. This study reports the effect of Dioscorea villosa extracts on the physiological well-being of the West African dwarf buck.

MATERIALS AND METHODS
Preparation of extract
Dioscorea villosa rhizomes were gotten within Ilorin metropolis. It was cleaned to remove dirt, air-dried, pound to pulp and packaged in cellophane bag for extraction. The extraction of the active substance of the plant parts were carried out with a modified method of Swain (Swain, 1999) with 96% ethanol at 75- 80°C in a soxhlet apparatus for four hours. At the end of the extraction, the liquid extracts were filtered using Whatman filter paper. The filtrate were concentrated under reduced pressure in a vacuum dessicator at 30°C for 25 minutes using a rotary evaporator (Gallenkamp, UK) to obtain a dark brown mass. The resulting residues (extract) were transferred to a hot air oven where they were dried to a constant weight at 45°C. Subsequently, 5g of the extract was dissolved in 250ml of saline water to obtain appropriate concentrations suitable to achieve a 0.5ml dose by volume of extract which was later administered subcutaneously to the animals for a period of seven days.

Management of animals
Thirty healthy male West African dwarf goats aged 12 to 24months were used for this experiment. The animals were quarantined for fourteen days during which they were treated against PPR using Tissue Culture Rinderpest Vaccine and dewormed using Albendazole at a dosage of 2ml/10kg body weight. They were examined to be free of any obvious abnormalities of the palpable reproductive organs.

Housing: They were housed in pens with slatted wooden floors with wooden feeding trough and plastic drinker. Animals were randomly assigned to five treatment groups of six animals each after equalization of weight.

Feeding: The animals were managed intensively. They were fed Panicum
maximum ad- libitum and 500g/animal of concentrate ration consisting of wheat offal 40%, corn offal 35%, palm kernel cake 22%, bone meal 2%, mineral / salt mixture 1% to give a crude protein of 17.20, crude fibre 12.11, ether extract 3.63 and ash 9.35. Water was provided ad-libitum. They were weighed, their heart beat and pulse rate as well as rectal temperature all followed the same trend and were recorded weekly for the period of seven days the experiment lasted. Feed and water were provided ad-libitum.

Experimental procedure
The goats were randomly assigned into five treatments of six animals each. Ethanolic extract of Dioscorea villosa (0.01ml/kg, 0.02ml/kg, 0.03ml/kg body weight) were administered subcutaneously to treatments C, D and E respectively while A served as the control, B served as standard and received 0.01ml/kg normal saline and sildenafil citrate respectively. Blood was collected on the third and sixth day of administration of extracts from each animal into heparinized and plain sample bottles for the determination of complete blood count and serum chemistry respectively.

Haematological and Biochemical assay
The haematocrit, blood counts, total protein and albumin were determined by standard methods.

Statistical analysis
Data on physiological indices (blood-pressure, pulse-rate, rectal temperature) as well as, reproductive (sperm count, live-dead ratio, sperm motility, abnormality), haematology (PCV, Hb, RBC, WBC) and biochemical parameters (TP and ALB) were analyzed using the analysis of variance (ANOVA) procedure following a completely randomized model (Steel and Torrie, 1990) and the level of significance were determined using the Duncan’s Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION
The physiological, haematological and biochemical effect of Dioscorea villosa on West African Dwarf bucks are shown in Table 1. The blood-pressure, pulse rate and temperature all followed the same trend and were highest in group C, followed by D. It was observed that Hb, PCV, RBC and WBC increase with the level of extract and was significantly different (p < 0.05). There were no significant differences in serum total protein (TP) between groups C, D and E but differ significantly when compared to groups A and B. TP increase as the level of extract is increased, but reduces at the highest dosage of 0.03ml/kg body weight. The serum albumin levels of groups A, B, C and E were not significantly different(p > 0.05) but differ significantly from group D, the highest was observed in group E and the lowest was in group D. The results of this study show that the ethanolic extract of Dioscorea villosa rhizome administered subcutaneously at the dosages used for the period of experiment appears to enhance the haemopoietic system. The increase may have occurred due to reduction in the destruction of blood cells and probably increased blood cell synthesis (Duncan et al., 1994; Son et al., 2007; Ilesanmi, 2009). This could also be observed in the increased total serum protein and albumin as extract doses increase. This seems to support previous hypothesis that Dioscorea villosa and other Dioscorea species possesses dehydroepiandrosterone (DHEA)- like properties and acts as a precursor to human sex hormones such as estrogen and progesterone, hence its use in the treatment of painful menstruation, hot flashes and headaches associated with menopause(Wren, 1994; Scott et al., 2000; Eagon et al., 2001; Komesaroff et al., 2009). The effect of Dioscorea villosa saponin constituent diosgenin on lipid metabolism are well documented and are probably due to impaired intestinal cholesterol absorption (Foot and Duke, 1990; Watson, 1993; Son et al., 2007). There have been studies to show that Dioscorea has antioxidant activities (Araghiniknam et al., 1996; Middleton et al., 2000; Oda et al., 2000; Raju et al., 2007), and the anti-inflammatory activity can be linked to the anti-phlegistic effect of the steroidal saponins. This could be linked to the increased serum total protein (TP) when compared with the control as well as the globulin level since albumin was not significantly different (p > 0.05). Some
The species of Dioscorea (D. sylvatica and D. dregeana) have been reported to show antibacterial activity against Gram-positive bacteria and Gram-negative, Escherichia coli (Kelmanson, 2002). The significant improvement in sperm count (Table 2) at the lowest dose of 0.01ml/kg BW lend support to its use as sexual stimulant or aphrodisiac either singularly or in combination with other herbal plants in human (Qureshi et al., ...

---

Table 1. Effect of dioscorea villosa (dv) on haematological, biochemical and physiological parameters of west african dwarf bucks.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb, g/dl</td>
<td>6.10b</td>
<td>8.10a</td>
<td>8.10a</td>
<td>8.70a</td>
<td>7.90a</td>
<td>±0.048</td>
</tr>
<tr>
<td>PCV, %</td>
<td>18.00c</td>
<td>24.00b</td>
<td>29.00a</td>
<td>30.00a</td>
<td>25.10b</td>
<td>±2.638</td>
</tr>
<tr>
<td>RBC, ×10^6 mm^-3</td>
<td>2.10b</td>
<td>3.10a</td>
<td>3.00a</td>
<td>3.40b</td>
<td>2.30b</td>
<td>±0.065</td>
</tr>
<tr>
<td>WBC, ×10^3 mm^-3</td>
<td>6.80c</td>
<td>8.20b</td>
<td>9.40b</td>
<td>10.20a</td>
<td>10.60a</td>
<td>±0.058</td>
</tr>
<tr>
<td>Total protein, g/dl</td>
<td>53.00c</td>
<td>62.00b</td>
<td>67.00a</td>
<td>72.00a</td>
<td>68.00a</td>
<td>±3.523</td>
</tr>
<tr>
<td>Albumin, g/dl</td>
<td>36.00a</td>
<td>35.00a</td>
<td>36.00a</td>
<td>32.60b</td>
<td>37.00a</td>
<td>±5.503</td>
</tr>
<tr>
<td>Blood pressure, mmHg</td>
<td>118/69</td>
<td>102/68</td>
<td>134/111</td>
<td>131/181</td>
<td>106/82a</td>
<td>±14.00/ 9.53</td>
</tr>
<tr>
<td>Pulse-rate, beat/min.</td>
<td>68.00b</td>
<td>78.30a</td>
<td>76.50a</td>
<td>71.00b</td>
<td>73.40b</td>
<td>±9.27</td>
</tr>
<tr>
<td>Rectal temp., °C</td>
<td>38.20</td>
<td>38.40</td>
<td>38.70</td>
<td>38.70</td>
<td>38.50</td>
<td>±0.08</td>
</tr>
</tbody>
</table>

Means with different superscript on the same row are significantly different (P< 0.05). Dv- Dioscorea villosa, Sc- Sildenafil- citrate, BW- Bodyweight, SEM- Standard error of the mean, PCV- Packed cell volume, RBC- Red blood cell, Hb- Haemoglobin, WBC- White blood cell.

Table 2. Effect of dioscorea villosa (dv) on reproductive function of west african dwarf bucks.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sperm count, 10^9/ml</td>
<td>1.38bd</td>
<td>1.65acde</td>
<td>1.90a</td>
<td>1.44bd</td>
<td>1.30bc</td>
<td>±0.13</td>
</tr>
<tr>
<td>Motility, %</td>
<td>65.00a</td>
<td>40.50b</td>
<td>45.30b</td>
<td>31.20c</td>
<td>14.70d</td>
<td>±2.15</td>
</tr>
<tr>
<td>Live-dead ratio</td>
<td>4.53ac</td>
<td>3.16bc</td>
<td>5.47a</td>
<td>1.96b</td>
<td>1.65b</td>
<td>±0.65</td>
</tr>
<tr>
<td>Semen pH</td>
<td>6.90</td>
<td>7.10</td>
<td>6.80</td>
<td>7.30</td>
<td>7.10</td>
<td>±0.27</td>
</tr>
<tr>
<td>Live spermatozoa, %</td>
<td>81.50a</td>
<td>75.30bc</td>
<td>83.46a</td>
<td>64.60bc</td>
<td>61.30b</td>
<td>±3.81</td>
</tr>
<tr>
<td>Sperm abnormality, %</td>
<td>7.33b</td>
<td>12.33a</td>
<td>9.62b</td>
<td>16.23a</td>
<td>14.75a</td>
<td>±1.22</td>
</tr>
<tr>
<td>Serum testosterone, g/dl</td>
<td>1.20</td>
<td>1.40</td>
<td>1.40</td>
<td>1.20</td>
<td>1.30</td>
<td>±0.12</td>
</tr>
</tbody>
</table>

Means with different superscript on the same row are significantly different (P< 0.05). Dv- Dioscorea villosa, Sc- Sildenafil- citrate, SEM- Standard error of the mean.
oses was increased in this associated with androgen usage in human. It helps to reduce withdrawal symptoms an abrupt increase in serum androgen enhancing extracts it could prevent. When used in combination with other same time decreasing serum androgen. increase in serum oestrogen while at the time of an endogenous sex hormone in terms of an destruction it could provide balance for endogenous sex hormone in terms of an increase in serum oestrogen while at the same time decreasing serum androgen. When used in combination with other androgen enhancing extracts it could prevent an abrupt increase in serum androgen and helps to reduce withdrawal symptoms associated with androgen usage in human.

CONCLUSIONS
In conclusion, *Dioscorea villosa* rhizome extract at a dose of 0.01ml/kg body weight support haemopoietic system by helping to improve blood synthesis or reduce its destruction. It could provide balance for endogenous sex hormone in terms of an increase in serum oestrogen while at the same time decreasing serum androgen. When used in combination with other androgen enhancing extracts it could prevent an abrupt increase in serum androgen and helps to reduce withdrawal symptoms associated with androgen usage in human.

REFERENCES


