PAT June, 2018; 14 (1): 38-48 ISSN: 0794-5213

Online copy available at *www.patnsukjournal.net/currentissue*

Publication of Nasarawa State University, Keffi

Sexual Response and Semen Characteristics of West African Dwarf Bucks Subcutaneously Administered With A Polyherbal Extract

[1]OKUKPE K. M*., [1]ADELOYE A. A., [2]SOLADOYE A. O., [3]ADUA M. M., [1]ADEYINA A.O., [1]ALLI O.I., [1]DECAMPOS J.S. and [4]OSHO BAMIDELE

[1]Reproductive Physiology Unit, Department of Animal Production, Faculty of Agriculture.
[2]Department of Physiology, College of Medicine, University of Ilorin, P.M.B. 1515, Ilorin, Kwara State, Nigeria.
[3]Animal Health Unit, Department of Animal Science, Nasarawa State University, Keffi, Nasarawa State, Nigeria.
[4]Department of Animal Production and Health, Federal University of Technology, Akure, Ondo State, Nigeria.
**Correspondence author: okukpekehinde@yahoo.com ; +2348066716145*

ABSTRACT

Twenty-four (24) West African Dwarf bucks with average initial weights of 10kg were used in an experiment to investigate the effect of varying levels of a poly-herbal mixture of Mucuna pruriens, Tribulus terrestris, Myristica fragrans and Dioscorea villosa on the sexual response and semen characteristics of the West African Dwarf buck. The extract was administered subcutaneously in different doses (0.01, 0.02, 0.03, 0.04, 0.06 and 0.08ml/kg BW), while the control and standard groups were given 0.01ml/kg normal saline solution and sildenafil citrate respectively. Blood was collected on the fourth 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. The pituitary and hypothalamus were excised at the end of experiment for histochemical study. Subcutaneous administration of polyherbal extract at different doses had varying effect on the sexual behaviour, mounting frequency was significantly different ($p < 0.05$) in all the extract and was dose dependent. Semen characteristics were also significantly ($p < 0.05$) influenced by the extracts and were dose dependent. Anterior pituitary hormones; Follicle stimulating hormone, Luteinizing hormone and serum testosterone were also dose dependent. Prolactin production was significantly ($p < 0.05$) reduced with increase in extract doses, hence the prolonged duration of mating. West African Dwarf bucks subcutaneously administered polyherbal extracts performed optimally at a dose of 0.03ml/kg body weight with no conspicuous adverse reaction and toxicity.

Keywords*: Polyherbal, bucks, extract, semen, pituitary.*

INTRODUCTION

The erection of the penis is a necessity for sexual activity in males and it involves the integration of complex physiologic processes that involves the central nervous system, peripheral nervous system, as well as hormonal and vascular systems. Any abnormality involving these systems either from medication or disease has a significant effect on the ability to develop and maintain an erection, as well as ejaculate (Feldman *et al.,* 1994 and Gopumadhavan *et al.,* 2003). It is a well known fact that filling of the corpora cavernosa with blood relies on the neural and hormonal mechanisms operating at various levels of the neural axis (Adaikan *et al*., 2000). This is unique among visceral functions, as it requires central neurological input. The process leading to erections represents only a single component of the penile element. Achievement and maintenance of a full erection also depends on the status of the peripheral nerves, the integrity of the vascular supply and biochemical events within the corpora cavernosa (Mitra *et al.,* 1996; Adimoelja, 2000). Sperm output is a product of a number of factors such as age, species, season, scrotal size, frequency of ejaculation and degree of sexual preparation (Kumar *et al.,* 1994). The degree of sexual preparation is influenced by androgen production by the interstitial (leydig) cells of the testis (Kafi *et al.,* 2004; Osinowo, 2006 and Okukpe *et al*., 2012c). The entire male reproductive system is dependent on hormones, which are chemicals that stimulate or regulate the activity of cells or organs

(Levasseur and Thibault, 1980). The primary hormones involved in the functioning of the male reproductive system are follicle-stimulating hormone (FSH), luteinizing hormone (LH) and testosterone (Lunstra *et al.,* 1989). Follicle-stimulating hormone (FSH) and Luteinizing hormone (LH) are produced by the pituitary gland located at the base of the brain. FSH is necessary for sperm production (spermatogenesis), and LH stimulates the production of testosterone, which is necessary to continue the process of spermatogenesis. Testosterone also is important in the development of male characteristics, including muscle mass and strength, fat distribution; bone mass and sex drive (Mori, 1992). Several reported negative health consequences associated with anabolic steroid abuse include infertility, hair-loss, breast development in males, heart-attack and liver tumors. Many plant extracts are employed among various cultures to improve sexual performance in human with different effect. Though a large number of pharmacological agents are orally consumed and vasoactive agents inserted intra-urethrally or injected intrapenially to regain good erection in man (Qureshi *et al.,* 1989; Gopumadhavan *et al.,* 2003), these drugs are not free from side effects. In the present study, a poyherbal formulation containing extracts of *Mucuna pruriens, Tribulus terrestris, Myristica fragrans* and *Dioscorea villosa* at different combinations is been evaluated for its effects on sexual performance in West African Dwarf bucks.

MATERIALS AND METHODS

Preparation of extract

Mucuna pruriens, Tribulus terrestris, Myristica fragrans and Dioscorea villosa plant parts were gotten within Ilorin metropolis. The seeds were air-dried, picked to remove dirt, ground to powder 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^{o}C in a soxhlet apparatus for four hours. At the end of the extraction, the liquid extracts were filtered using 125mmWhatman filter paper. The filtrate were concentrated under reduced pressure in a vacuum dessicator at 30^{o}C for 25minutes 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^{o}C. Subsequently, 5g each of *Mucuna pruriens* and *Tribulus terrestris* extracts with 2.5g each of *Myristica fragrans* and *Dioscorea villosa* extracts were mixed and 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 five days.

Management of animals

Twenty-four healthy male West African dwarf goats aged 12 to 24months and averagely 10kg weight 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 eight treatment groups of three 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. Feed and water were provided *ad-libitum.*

Experimental set-up

The goats were randomly assigned into eight treatments of three animals each. A poly-herbal

mixture of *Mucuna pruriens, Tribulus terrestris, Myristica fragrans and Dioscorea villosa* were administered subcutaneously to treatments C, D, E, F, G and H at doses of 0.01ml/kg, 0.02ml/kg, 0.03ml/kg, 0.04ml/kg, 0.06ml/kg and 0.08ml/kg body weight respectively. 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 fourth 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. Post-mating behavior tests, two animals were slaughtered from each treatment, their testes were collected, trimmed free of fat, stored in normal saline in an iced flask before it was taken to the laboratory for semen analysis. The heads of the animals were immediately severed and taken to the laboratory where a stainless saw was used to cut open the skull to expose the brain tissues, to excise the anterior pituitary and hypothalamus from it. The anterior pituitary and hypothalamus tissues were collected in labelled bottles containing 2% sucrose solution before it was taken to the laboratory for histochemical analysis.

Mating behavior test

Effect of the extracts on mating behavior was studied according to the methods described by Gopumadhavan *et al*., (2003) and Tajuddin *et al*., (2005). Healthy and sexually experienced bucks were selected for the study. A male was considered sexually active if it attempted to mount any active female introduced into the pen. They were divided into eight groups each consisting of four bucks and housed individually in pens during the experiment. Group A served as control group and received 0.1ml/kg of normal saline subcutaneously for 5days at 1900h GMT. Group B served as standard group and was given suspension of the standard drug 1hour before the commencement of the experiment. Groups C- H received suspension of the extracts in normal saline subcutaneously at doses of 0.01, 0.02, 0.03, 0.04, 0.06 and 0.08ml/kg BW respectively, once a day for 5days at 1900h GMT. The bucks were made familiar to the pens 14days before the start of experiment.

The does used were induced into oestrus by the method of Gopumadhavan *et al.*, (2003) by a simple intramuscular injection of oestradiol valerate at a dose of 1.5ml/doe intramuscularly 48h before the test. The receptivity of the female animals was confirmed before the test by exposing them to male animals other than the test animals. The most receptive does were selected for the study. The test was carried out on the 5th day after commencement of the treatment of the male animals. The receptive does were introduced into the pens of bucks with 1doe to a buck. The observation for mating behavior was immediately commenced and continued for first 2mating series. The test was terminated if the male failed to show sexual interest. The occurrence of events and phases of mating were called out to be recorded on an audio-cassette as soon as they appeared. Their disappearance was also called out and recorded. The frequencies and phases were determined from cassette transcriptions.

(a) **Mounting frequency, Mf**: Number of mounts in a given period of time (15min) i.e.number of mount before ejaculation.
(b) **Mounting latency, Ml**: Time taken for the first mount after the introduction of female into the male pen.
(c) **Intromission frequency, If**: Number of intromission before ejaculation.
(d) **Intromission latency, Il**: Time taken for the first intromission after the introduction of the female into the male pen.
(e) **Ejaculation frequency, Ef**: Number of ejaculations in a given period of time (15min).
(f) **Ejaculation latency, El**: Interval between the first mount to first ejaculation.
(g) **Total sexual behavior, TSB**: Male sexual behavior such as genital grooming and sniffing at females was visually monitored and recorded.

In the second mating series only the ejaculation latency was recorded.

Semen analysis and Histochemical studies

The semen volume, sperm concentration, sperm motility, sperm maturity, sperm morphology/viability and serum testosterone were determined by standard methods. Histochemical evaluation of anterior pituitary for FSH/LH- producing basophil and ACTH cells.

Statistical analysis

Data on sexual behavior (MF, ML, IF, IL, EF, EL and TSB), semen analysis (semen volume, sperm concentration, sperm motility, motile/non-motile ratio, progressive assessment and morphology), histochemical parameters (FSH, LH and prolactin) as well as serum testosterone were analyzed using the analysis of variance (ANOVA) procedure following a completely randomized model (Steel and Torrie, 1980) and the level of significance were determined using the Duncan's Multiple Range Test.

RESULTS

The results of the effects of a polyherbal extract on sexual behavior, semen characteristics and histochemical evaluation are shown on tables 1, 2 and 3 respectively.

As observed on table 1, the effects of the polyherbal extract on sexual behavior was significantly different in all the parameters examined. Mounting frequency was significantly higher in treatment E, followed by G, H, D and F, but significantly lower in treatment A (control) followed by B and C in that order. Mounting latency was significantly higher in treatment A, followed by B, C and E while treatment D was significantly lower, and followed by H, F and G which were significantly close. Intromission frequency was significantly higher in treatments H, G and F but was significantly lower in treatment A followed by C, B, D and E which were significantly the same. On the other hand, intromission latency was significantly highest in treatments A and B, followed by treatments G, C, D, E and H which were not significantly different ($p > 0.05$). Intromission latency was lowest in treatment F. Ejaculation frequency was highest in treatments H, E, F,G and D which were significantly the same, followed by treatments B and C, while the lowest value was observed in treatment A which was not significantly different ($p > 0.05$) from treatment C. Ejaculation latency on the other hand, was highest in treatment F, followed by E, G, H and D while the lowest was observed in treatments A followed by treatments B and C which were significantly the same. The result of total sexual behavior (TSB) showed that treatments A, H and C were significantly low, followed by G while the highest values were observed in E, F, B and D which were significantly the same.

Table 2 showed the effects of polyherbal extract on semen characteristics of West African Dwarf bucks. Semen volume, motile count, sperm concentration, progressive motility assessment, total count in volume and head defect were significantly different ($p < 0.05$). Semen volume was significantly highest in treatment H, followed by treatments E, G and F which were significantly the same ($p > 0.05$). The lowest volume was observed in treatment A, followed by B, C and D which were significantly the same as treatment A ($p > 0.05$). Motile count was significantly high and the same in treatments A, E, B, C, F and G while it was significantly low in treatments H and D which were significantly the same ($p > 0.05$). Sperm concentration was significantly high and the same in treatments A, B, E, F, G and C while it was low in treatments H and D which were significantly the same ($p > 0.05$).

Moreover, the progressive motility assessment was significantly high in treatments E, A, B, F and C which were significantly the same ($p > 0.05$) while it was significantly low in treatments D, G and H which were not significantly different ($p > 0.05$). Total count in volume was significantly high and the same in treatments H, E, G and F. It was significantly low in A, followed by treatments D, C and B which were all significantly close. In the result of

morphological abnormality, head defect was significantly high in treatments H, F, D, G, C and B which were significantly the same ($p > 0.05$), while it was significantly low in treatments E and A, though not significantly different ($p > 0.05$). There was no significant difference ($p > 0.05$) in Percent motility, Motile- Non-motile ratio, morphologically normal spermatozoa as well as Percent neck and tail defects.

Results of the histochemical evaluation of the polyherbal extract on the adenohypophysial and hypothalamic male reproductive hormones (Table 3) shows significant difference ($p < 0.05$) in serum testosterone, Follicle stimulating hormone (FSH), Luteinizing hormone (LH) and Prolactin. Serum testosterone was significantly highest in treatment F, followed by treatments C, D, B and H though not closely. The lowest value was observed in treatment G, followed by treatments E and A which were significantly the same ($p > 0.05$). FSH was significantly high in treatments A, B, C and E which were significantly the same ($p > 0.05$) while it was lowest in treatments H and G which were significantly the same ($p > 0.05$), later followed by treatment F.

Moreover, LH was significantly high in treatment A which was later followed by treatments B, E, C, D and F which were significantly close. It was significantly low in treatments H and G which were not significantly different ($p > 0.05$) from each other. The result of prolactin in the hypothalamus showed that it was significantly high in treatment A (control) while it was significantly low in treatment H, followed by treatments G, F, D, C, E and B which were all significantly close ($p > 0.05$).

Discussion

As observed in the result of the effects of the polyherbal extract on sexual behavior of WAD bucks (Table 1), the extract could improve sexual behavior, libido and performance as seen in the significant increase in mounting frequency, intromission frequency and ejaculation latency. Mounting frequency improved with increasing extract doses but reached its peak at treatment E. The intromission frequency and ejaculation latency also followed the same trend, increasing with increased extract doses. The total sexual behavior also followed the trend and reached its peak with treatment E after which it seems to reduce in its effects as the dose was increased. The constituents of the polyherbal extract such as *Mucuna pruriens*, *Tribulus terrestris*, *Myristica fragrans* and *Dioscorea villosa* have been used in traditional medicine as aphrodisiacs (Qureshi *et al*., 1989; Okukpe *et al*, 2012a, b). *Mucuna pruriens* has been reported to heightened arousal and increased sexual activity to a moderate extent but also sustained it for a longer time as indicated by the increase in ejaculation latency and decreased intromission latency. The increased in ejaculation frequency could be as a result of hypersensitivity of the genitals as well as the over- excitation of the regulatory centers (Gopumadhavan *et al.,* 2003). Mucuna pruriens has been reported to increase sperm motility and sperm concentration in the epididymis and vas deferens without its eliciting spermatotoxic effects (Qureshi *et al.,* 1989) as could be observed in the total count in volume which increases with increasing extract dose. It has also been reported to inhibit prolactin production, thus increasing libido and sexual performance (Giuliano *et al*., 2001; Rajeshwar *et al.,* 2005; Molloy *et al.,* 2006).

One of the phytochemical agents derived from *Tribulus terrestris*, protodioscin has been clinically proven to improve sexual desire and enhance erection through its conversion to dehydroepiandrosterone (Adimoelja, 2000; Adaikan *et al.,* 2000). It was reported to help to relax the corpus cavernosal smooth muscles which could probably be due to the increase in the release of nitric oxide from the endothelium and nerve endings with a resultant aphrodisiac activity (Mitra *et al.,* 1996; Adaikan *et al*., 2000). It has also been reported to increase luteinizing hormone levels, thus causing the production of testosterone with increased sperm volume and velocity (Gauthaman *et al.,* 2003). *Myristica fragrans* has been reported to have vasodilatory and smooth muscle relaxant property (Criddle *et al*., 2003; Damiani *et al*., 2003)

due to the presence of Eugenol which helps to inhibits lipid peroxidation as well as maintains the activities of enzymes such as superoxide dismutase, catalase, glutathione peroxidase, glutamine transferase and glucose-6-phosphate dehydrogenase (Kumaravelu *et al.,* 1996; Murcia *et al.,* 2004). It has been reported to improve mounting frequency and mating performance in rats (Burkill, 1985; Tajuddin *et al.,* 2003).

Dioscorea villosa, on the other hand has been reported to help to increase serum oestrogen and decrease serum androgen levels (Wu *et al.,* 2005). Any direct hormonal effect that can be attributed to *D. villosa* has been reported to be oestrogenic (Morgan, 2011). Its inclusion in the polyherbal formulation was due to its constituent of diosgenin (a steroidal saponin) reported to help to neutralize vaginal dryness in women (Brinker, 1997; Moerman, 1998; Cech, 2000; Hu *et al.,* 2007) and to assist in the maintenance of the duct system and provide for a balance to body hormone. Diosgenin has been 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 Benghuzzi, 2003). In this study, WAD bucks exhibited a marked change in sexual behavior. The results showed that the polyherbal extracts significantly increased the mounting frequency (MF), intromission frequency (IF), ejaculation frequency (EF) and ejaculation latency (EL) as compared to both the control (treatment A) as well as the sildenafil treated group (treatment B). The MF and IF are considered the indices of both libido and potency (Tajuddin *et al.,* 2005). Thus, the increase in the MF and IF indicates that the polyherbal formulation helps to increase libido and probably potency. The significant increase in EL suggests that the polyherbal formulation prolonged the duration of coitus i.e. it intensified sexual activity in a sustained manner. The significant decrease in ML and IL also provides evidence of aphrodisiac effect of the polyherbal extract. These findings showed that the polyherbal extract produce a remarkable enhancement of the total sexual function of normal male animals.

The effects of the polyherbal extract on fertility was studied by assessing the semen characteristics after the gonads were harvested and the spermatozoa contained in it emptied into measuring cylinders for assessments. It was observed that semen volume, motile count, sperm concentration, progressive motility assessment and total count in volume as well as head defect significantly increased with increasing extract dose. This observation is consistent with previous works with the various constituents of the polyherbal extract that it improves sexual performance in terms of libido, increased testosterone level, vasodilation and smooth muscle relaxant property as well as oestrogenic effect (Dahanukar and Hazra, 1995; Criddle *et al.*, 2003; Damiani *et al.,* 2003; Tucci and Benghuzzi, 2003; Yang *et al.,* 2004; Tajuddin *et al.*, 2005; Wu *et al.*, 2005; Molloy *et al.,* 2006; Gauthaman *et al.*, 2008). Sperm output has been reported to depend on a number of factors which include age, species, season, scrotal size, frequency of ejaculation and more importantly the degree of sexual preparation which the polyherbal extract seems to enhance (Osinowo, 2006; Okukpe *et al.,* 2012c). The degree of sexual preparation was reported to be influenced by the production of testosterone by the interstitial cells of the testis. The increase in sperm-head defect with increasing polyherbal extract could reduce its fertilizing ability, thus the best treatment dose would be treatment E (0.3ml/kg BW) for optimum performance in terms of libido and fertilizing capability.

Furthermore, the result of the histochemical evaluation of the polyherbal extract on the adenohypophysial and hypothalamic male hormones showed that serum testosterone, FSH, LH and prolactin were significantly influenced by the polyherbal extract. This supports the previous findings in this study and is in agreement with earlier works on the polyherbal extract constituents. This suggests that there is a direct relationship between testicular sperm production, epididymal sperm count and sexual preparation. As earlier reported, sexual preparation is influenced by testosterone production by the leydig cells of the testis (Osinowo, 1981, Oyeyemi *et al*., 2011). Testosterone production has been reported to be regulated by LH

which acts on the leydig cells (Hafez, 1980). It should be emphasized that the studies in-vitro as well as in hypophysectomized animals provide strong evidence that LH is the only hormone capable of stimulating testicular steroidogenesis in the absence of other hormones (Bartke *et al.,* 1978; Copland *et al.,* 2009). Testosterone stimulates the formation of spermatogonia from the germinal epithelium in the seminiferous tubules and is a requirement for the reduction division of primary spermatocytes to secondary spermatocytes, and from secondary spermatocytes to spermatids. There is abundant evidence that FSH can augment the action of LH on plasma testosterone levels and on the growth of androgen-dependent male accessory reproductive glands (Bartke *et al*., 1978). The maturation of spermatids into spermatozoa requires FSH. The increase in sperm-head defects with increase in extract dose could be as a result of the decreased production of FSH. Thus, the optimum treatment for best performance in terms of libido and fertilizing capacity would be treatment E (0.03ml/kg BW) since the FSH value was not significantly different ($p > 0.05$) from the control group.

Finally, prolactin, a hormone whose production is stimulated by the hypothalamic effect has been implicated in the negative feedback on the leydig cells to stop the production of testosterone and thus reduced libido after ejaculation. An important aspect of the study of pituitary effects on the testis concerns the apparent ability of very high levels of PRL to inhibit testicular function. In men, hyperprolactinemia (usually traceable to adenohypophyseal PRL-producing microadenomas) can be associated with hypogonadism and impotence (Thorner *et al.,* 1977). In rats, transplantation of PRL- producing tumors induced testicular atrophy (Bartke *et al.,* 1977). Prolactin reduction suggests an increase in the intensity and prolonged duration of coitus. Its gradual reduction as extract dose increase suggests its ability to intensify sexual activity in a sustained manner, corroborating the report of Tajuddin *et al.* (2005). It buttresses the fact that the polyherbal extract significantly increase the frequency of all components of penile reflexes such as erection, quick flips and long flips. This substantiates the indications of the mating behavior test to show in a rather conclusive manner that the polyherbal extract enhances both libido and potency in normal male animals. In conclusion therefore, it is suggested that for optimum performance the best polyherbal extract dose is 0.03ml/kg BW, though none produce signs of toxicity or treatment- related adverse effects, the short- term use for increased sexual function is apparently safe.

Although it is difficult to explain the exact mechanism responsible for improved sexual function. The extracts seem to induce changes in neurotransmitter level or their action at cellular levels could change sexual behavior (Hart *et al.,* 1968; Szechtman *et al.,* 1981; Davidson, 1981). Constituents of the polyherbal extracts such as *Myristica fragrans* has been mentioned in ethnomedical report as having nervous stimulating property (Parle *et al*., 2004; Tajuddin *et al*., 2005). *Tribulus terrestris* has been reported to increase luteinizing hormone (LH) level as well as cause the production of testosterone and increased sperm volume and velocity as could be observed in the increase in semen volume, sperm concentration and progressive motile assessments (Mitra *et al*., 1996; Adaikan *et al*., 2000; Osinowo, 2006). Furthermore *Mucuna pruriens* has been reported to inhibit prolactin production, thus increased libido and sexual performance as manifested in the prolong erection and duration of coitus (Qureshi *et al*., 1989; Adimoelja *et al.,* 2000; Guiliano *et al*., 2001). However, *Dioscorea villosa* is necessary to provide a balance of hormone as well as improve the duct system for enhanced ejection of spermatozoa in coitus (Aradhana *et al*., 1992; Tucci and Benghuzzi, 2003; Morgan, 2011). Preliminary phytochemical studies indicate the presence of sterols, phenols and alkaloids in the extract which might have contributed to the sexual function improving effect of the polyherbal extract. Further studies on the identification and quantification of the active constituents responsible for sexual function improving activities as well as the mechanism through which it augments sexual function could be researched.

Table 1: Effects of a polyherbal extract on sexual behavior of West African dwarf bucks.

	Polyherbal extract (ml/kgBW)								
Parameters	**A 0.01saline**	**B 0.1**	**C 0.01**	**D 0.02**	**E 0.03**	**F 0.04**	**G 0.06**	**H 0.08**	**± SEM**
Mounting Frequency	14.00^{d}	27.00^{cd}	30.00^{bc}	35.00^{ab}	38.00^{a}	33.00^{ab}	37.00^{ab}	35.00^{ab}	2.23
Mounting Latencysec^{-1}	162.50^{a}	80.00^{b}	63.00^{b}	40.00^{d}	60.00^{bc}	50.00^{c}	52.00^{c}	45.00^{cd}	5.25
Intromission Frequency	5.50^{c}	7.50^{b}	6.50^{c}	8.00^{b}	9.00^{b}	9.50^{ab}	10.00^{a}	12.00^{a}	0.80
Intromission Latencysec^{-1}	143.00^{a}	126.00^{a}	102.00^{b}	97.00^{bc}	85.00^{bc}	78.00^{c}	103.00^{b}	84.00^{bc}	5.87
Ejaculation Frequency	3.00^{c}	6.00^{b}	4.00^{c}	8.00^{ab}	9.00^{a}	9.00^{a}	8.00^{ab}	10.00^{a}	0.85
Ejaculation Latencysec^{-1}	170.00^{c}	270.00^{b}	276.00^{b}	345.00^{a}	350.00^{a}	364.00^{a}	348.00^{a}	345.00^{a}	6.60
Total sexual Behaviour	20.00^{d}	33.00^{a}	26.00^{cd}	32.00^{ab}	35.00^{a}	33.00^{ab}	28.00^{b}	24.00^{cd}	2.07

Means with different superscript on the same row are significantly different (P< 0.05). Pex- Polyherbal extract, *Sc- Sildenafil- citrate, BW- Bodyweight,* SEM- Standard error of the mean.

Table 2: Effects of polyherbal extract on semen characteristics of West African dwarf bucks. Polyherbal extract (ml/kgBW)

Semen characteristics	**A 0.01 saline**	**B 0.1**	**C 0.01**	**D 0.02**	**E 0.03**	**F 0.04**	**G 0.06**	**H 0.08**	**± SEM**
Semen Volume, ml	1.70^{c}	2.70^{c}	2.80^{c}	3.00^{c}	4.00^{b}	3.90^{b}	4.00^{b}	6.10^{a}	1.05
Motile Count, x10^{6}/ml	80.00^{a}	76.00^{a}	76.00^{a}	65.00^{b}	78.00^{a}	75.00^{a}	74.00^{a}	60.00^{b}	4.15
Sperm conc., x10^{6}/ml	100.00^{a}	95.00^{a}	88.00^{ab}	81.00^{b}	91.00^{a}	89.00^{ab}	88.00^{ab}	80.00^{b}	4.28
Motility, %	80.00	80.00	75.00	75.00	84.00	83.00	84.00	75.00	3.41
Motile- Non-motile ratio	4.00	4.00	3.00	3.00	5.00	5.00	6.00	3.00	0.96
Progressive assessment, %	60.00^{a}	57.00^{a}	53.00^{ab}	50.00^{b}	62.00^{a}	55.00^{ab}	50.00^{b}	50.00^{b}	2.28
Total Count in volume, x10^{6}/ml	170.00^{b}	259.00^{b}	246.00^{b}	243.00^{b}	364.00^{a}	349.00^{a}	357.00^{a}	492.00^{a}	44.50
Normal Sperm, %	65.00	63.00	60.00	57.00	66.00	60.00	62.00	55.00	4.16
Neck defect, %	10.00	12.00	10.00	11.00	8.00	10.00	11.00	10.00	0.97
Tail defect, %	5.00	4.00	4.00	6.00	3.00	5.00	6.00	10.00	3.06
Head defect, %	20.00^{bc}	21.00^{b}	21.00^{b}	24.00^{a}	18.00^{c}	25.00^{a}	21.00^{b}	25.00^{a}	1.51

Means with different superscript on the same row are significantly different (P< 0.05). Pex- Polyherbal extract, *Sc- Sildenafil- citrate, BW- Bodyweight,* SEM- Standard error of the mean.

Table 3: Effects of a polyherbal extract on serum testosterone, adenohypophysis and hypothalamic male hormones.

	Polyherbal extract (ml/kg BW)								
Parameters	A 0.01 saline	B 0.1	C 0.01	D 0.02	E 0.03	F 0.04	G 0.06	H 0.08	± SEM
Serum testosterone, ng/ml	1.00^{cd}	1.60^{b}	1.91^{b}	1.67^{b}	0.96^{cd}	10.78^{a}	0.69^{d}	1.57^{b}	0.23
FSH, MIU/ml	5.22^{a}	4.33^{a}	4.11^{a}	3.96^{b}	4.05^{a}	3.83^{b}	1.60^{c}	0.53^{c}	0.35
LH, MIU/ml	3.12^{a}	2.16^{b}	1.94^{b}	1.68^{b}	2.00^{b}	1.61^{bc}	0.90^{cd}	0.53^{d}	0.22
Prolactin, ng/ml	0.35^{a}	0.20^{b}	0.17^{b}	0.15^{bc}	0.20^{b}	0.13^{c}	0.13^{c}	0.09^{c}	0.02

a, b, c, d- Means with different superscript on the same row are significantly different (P< 0.05). Pex- Polyherbal extract, Sc- Sildenafil- citrate, BW- Bodyweight, SEM- Standard error of the mean, FSH- Follicule Stimulating Hormone, LH- Luteinizing Hormone.

References

Adaikan, P.G., Gauthaman, K., Prasad, R.N. and Ng, S.C. (2000): Proerectile pharmacological effects of *Tribulus terrestris* extract on the rabbit corpus cavernosum. *Ann. Acad. Med. Singapore 29(1): 22-26.*

Adimoelja, A. (2000): Phytochemicals and the breakthrough of traditional herbs in the management of sexual dysfunctions. *Int. J. Androl. 23 (Suppl 2): 82-84.*

Aradhana, Rao, A.R. and Kale R.K. (1992): Diosgenin--a growth stimulator of mammary gland of ovariectomized mouse. *Indian J. Exp. Biol*. 30(5): 367-70.

Bartke, A., Hafiez, A.A., Bex, F.J. and Dalterio, S. (1978): Hormonal Interactions in Regulation of Androgen Secretion. *Biology of Reprod.* 18: 44- 54.

Bartke, A., Smith, M.S., Michael, S.D., Peron, F.G. and Dalterio, S. (1977): Effects of experimentally-induced chronic hyperprolactinemia on testosterone and gonadotropin levels in male rats and mice. *Endocrinology* 100: 182- 186.

Brinker, F. (1997): Herbal Contraindication and Drug interaction: Plus Herbal Adjuncts with Medicines, 4th ed. Ecletic Medical Publication.

Burkill, I.H., (1985): Dictionary of the Economic Products of the Malay Peninsula 2. Vol.2. London: I- Z, Crown Agents: pp.1554-1556.

Cech, R. (2002): Growing At-risk Medicinal Herbs: Cultivation, Conservation, and Ecology. Williams, OR: Horizon Herbs. www-personal.umich.edu/~rburnham/SpeciesAccountspdfs/ DiosvillDIOSFINAL.pdf .

Copland, J.A., Sheffield-Moore, M., Koldzic-Zivanovic, N., Gentry, S., Lamprou, G., Tzortzatou- Stathopoulou, F., Zoumpourlis, V., Urban, R.J. and Vlahopoulos, S.A. (2009): Sex steroid receptors in skeletal differentiation and epithelial neoplasia: is tissue-specific intervention possible? *Bioessays 31 (6): 629- 641. Review. PMID 19382224.*

Criddle, D.N., Madeira, S.V., Soares de Murta, M. (2003): Independent Endothelium-dependent and – vasodilator effects of eugenol in the rat mesenteric vascular bed. *J Pharm Pharmacol.40:59- 66.*

Dahanukar, S.A. and Hazra, A. (1995): Ayurveda unraveled. In: Heal with Herbs-Dahanukar SA, ed. New Delhi, India: Publication and Information Directorate, *Council of Scientific and Industrial Research; 53-74.*

Damiani, C.E. and Rossoni L.V. (2003): Vasorelaxant effect of eugenol on rat thorasic aorta. *Vascular Pharmacol 40:59-66.*

Davidson, J.M. (1981): Sexology: Sexual biology, behavior and therapy. In: Zewi H, editor, selected papers of Fifth World Congress of Sexology: 1981; Jerusalem. Excerpta Medica, Amesterdem- Princeton-Oxford; 1982. Pp42- 47.

Feldman, H.A., Goldstein, I., Hatzichristou, D.G., Krane, R.J and McKinlay, J.B. (1994): Impotence and its medical and psychosocial correlates: Results of the Massachusetts Male Aging Study. *J. Urol. 151(1): 54-61.*

Gauthaman, K., Adaikan, P.G. and Prasad, R.N. (2003): Aphrodisiac properties of *Tribulus terrestris* extract (protodioscin) in normal and Castrated rats. *Life Sciences 71(12):1385-96.*

Gauthaman, K., Ganisan, A.P. and Prasad, R.N. (2008): Sexual effects of puncture vine (*Tribulus terrestris*) extract (protodioscin) and evaluation using a rat model. *Journal of Alternative and Complementary Medicine 9 (2): 257-65.*

Giuliano, F. and Allard J. (2001): Dopamine and sexual function. *Int J. Impot. Res. 13, Suppl. 3:S18- S28.*

Gopumadhavan S., Mohammed Rafiq, Venkataranganna M.V., Kala Suhas Kulkarni and Mitra S.K. (2003): Assessment of 'Tentex royal' for sexual activity in an experimental model. *Indian Journal of Clinical Practice 13 (10): 23- 26.*

Hafez, B. and Hafez, E.S.E. (2000): Functional Anatomy of Male reproduction. In: Reproduction in Farm Animals. Williams and Wilkins, Lippincoff, pp: 17, 512.

Hart B. L. and Haugen C. M. (1968): Activation of sexual reflexes in male rats by spinal implementation of testosterone. *Physiol Behav. 3: 735- 738.*

Hu, C., Lin, J., Liu, S. and Yang, D. (2007): A spirostanel glycoside from wild yam (*Dioscorea villosa)* extract and its cytostatic activity on three cancer cells. *J. Food and Drug Analysis, 15 (3), 310- 315.*

Kafi, M.Safdariam and Hashami M. (2004): Seasonal variation in semen characteristics, scrotal circumference and libido of Persian karakulrams. *Small ruminant research 53:133-139*

Kumar K.V.A, Srinivasan K.K., Shanbhag T., and Rao S.G. (1994): Aphrodisiac Activities of the seeds of *Mucuna Pruriens*. *Indian drug 31:321-7.*

Kumaravelu., Subramanyam S, Dakshinmurthy D.P. and Devraj N.S. (1996): The antioxidant effect of eugenol on carbon-tetrachloride-induced erythrocyte damage in rats. *J. Nut Biochem.7:23- 28.*

Levasseur M. and Thibault C. (1980): In: E.S.E. Hafez (ed.) Reproduction in Farm Animals, Les Febigers, 4th edition. Philadelphia P.A. pg130- 149.

Lunstra D.D., Boyd G.W. and Corah L.R. (1989): Effects of natural mating stimuli on serum luteinizing hormone, testosterone and oestradiol -17β in yearling beef bulls. *J. Anim. Sci. 67: 3277- 3288.*

Mitra S.K, Muralidhar T.S and Rao D.R.B. (1996): Experimental assessment of relative efficacy of drugs of herbal origin on sexual performance and hormone levels in alcohol exposed and normal rats. *Phytotherapy Res. 10: 296-299.*

Moerman, D.E. (1998): Native American ethnobotany. Portland, OR: Timber Press.

Molloy S.A, Rowan E.N., O'Brien J.T., McKeith I.G., Wesnes K. and Burn D.J. (2006): Effect of levodopa on cognitive function in Parkinson's disease with and without dementia and dementia with Lewy bodies. *J. Neurol. Neurosurg. Psychiatr. 77:1323-8.*

Morgan, M. (2011): Herbs for the treatment of dysfunctional uterine bleeding. *A Phytotherapist's Perspective, 45* (May), 1-3.

Mori Y. (1992): In: Brain Control of the Reproductive System. A.S. Yokoyama (ed.), Japan Scientific Press, CRC press, Tokyo, Boca Raton, pp93- 118.

Murcia M.A., Egea I., Romojaro F., Parras P, Jimenez A.M. and Martinez-Tome M., (2004): Antioxidant evaluation in dessert spices compared with common food additives. Influence of irradiation procedure. *J Agric Food Chem 52:1872-1881.*

Okukpe K.M., Adeloye A.A., Abayomi F.D., Alli O.I., Belewu M.A. and Adeyina, O.A. (2012b): Physiological effects of *Myristica fragrans* extract on West African Dwarf Bucks. *Medicinal Plants, 4(1): 1- 5.*

Okukpe, K.M., Adeloye, A.A., Adeyemi, K.D., Olatunde, O.A., Ojo, V. and Sola-Ojo, F.E. (2012c): Effects of Extender Types on Ram Semen Collected with Electroejaculator in a Tropical Environment. *Asian Journal of Animal Science 6(5): 249- 255.*

Okukpe K.M., Adeloye A.A., Alli O.I., Belewu M.A. and Adeyina O.A. (2012a): Physiological response of West African Dwarf Goats to graded levels of *Tribulus terrestris* extract. *Medicinal Plants, 3(4): 273- 277.*

Osinowo O. A. (2006): Introduction to Animal Reproduction. Sophie Academic Pub. Pp42

Osinowo O.A, Molokwu F.C. and Osori D.I.K. (1981): Growth and testicular development in Bunaji bulls. *Journal of Animal production Research 1:* 55-69.

Oyeyemi M.O., Samuel G.O., Ajayi T.A. and Adeniji, D.A. (2011): Semen characteristics and sperm morphological studies of the West African Dwarf Buck treated with Aloe Vera gel extract. *Iranian J. Rep. Med. 9(2): 23 - 88.*

Parle M, Dhingra D. and Kulkarni SK. (2004): Improvement of mouse memory by *Myrisatica fragrans* seeds. *J Med Food 7:157-161.*

Qureshi S, Shah AH, Tariq M and Ageel, AM. (1989): Studies on herbal aphrodisiacs used in Arab system of medicine. *Am. J. Chin. Med.* 17(1-2): 57- 63.

Rajeshwar Y, Kumar G.P.S., Gupta M., and Manzunder U.K. (2005): Studies on in-vitro antioxidant activities of *Mucuna pruriens(Fabaceae)* seeds, *Eur Bull Drug Res 13: 31-39.*

Steel, R.G.D. and J.H. Torrie, (1990): Principles and Procedures of Statistics: A Biometrical Approach. 2rd Edn., McGraw Hill Book Co., New York, USA Pages: 633.

Swain I. E., (1999) Phytochemical analysis. Academic Press, London, pp33- 88.

Szechtman H., Moshe H. and Rabi S. (1981): Sexual behavior Pain sensitivity and stimulates endogenous opioid in male rats. *Eur J. Pharmacol. 70: 279- 285.*

Tajuddin S., Ahmad S., Latif A., Qasmi I.A. and Amin K.M. (2005): An Experimental Study of Sexual Function Improving Effect of *Myristica fragrans*. Houtt. *BMC Complement Altern Med. 5:16.*

Tajuddin S., Ahmad S., Latif A. and Qasmi I.A. (2003): Aphrodisiac Activity of 50% Ethanol extract of *Myristica fragrans* Houtt (Nutmeg) and *Syzygium Aromaticum* (L) Merr and Perry (Clove) in male mice. A Comparative study. *BMC Complement Altern. Med. 3:6.*

Thorner M.O., Edwards C.R.W., Hanker J.P., Abraham G. and Besser G.M. (1977): Prolactin and Gonadotropin interaction in the male. In: The testis in normal and infertile men. (P. Troen and H.R. Nakin, eds), Raven Press, New York, pp351- 366.

Tucci, Michelle and Benghuzzi, Hamed. (2003): Structural changes in the kidney associated with ovariectomy and diosgenin replacement therapy in adult female rats. *Biomedical Sciences Instrumentation*, *39*: 341-346.

Wu, W.H., Liu, L.Y., Chung, C.J., Jou, H.J. and Wang, T.A. (2005).Estrogenic Effect of Yam Ingestion in Healthy Postmenopausal Women.*Journal of the American College of Nutrition*, *24*(4): 235 -243.

Yang N.Y.J, Kaphle K, Wang P.H, Jong D.S, Wu L.S and Lin J.H. (2004): Effect of aqueous extracts of betel quid and its constituents on testosterone production by dispersed mouse interstitial cells. *Am. J. Chin. Med. 32:705- 715.*