

Effect of *Mucuna pruriens* on the Reproductive Tract of Giant African Land Snail (*Archachatina marginata*)

Abiona, J. A*, Ojo, O., Ladokun, A. O., Abioja, M. O., Daramola, J. O., James, I. J., Osinowo, O. A., and Onagbesan, O. M.

Department of Animal Physiology, College of Animal Science & Livestock Production, University of Agriculture, P.M.B. 2240 Abeokuta, Nigeria.

Corresponding author: abionajohn@yahoo.ca, +234-8067268826

Target Audience: Snail farmers, Animal Scientist

Abstract

*A study was conducted to evaluate the effect of *Mucuna pruriens* on the reproductive tract of Giant African Land snail (*Archachatina marginata*). Thirty (30) snails weighing between 100 to 150g were used with ten replicate per treatment. Feed given were: concentrate, mixture of concentrate and *Mucuna* seed meal and *Mucuna* seed meal only. Parameters measured include: Organ weight, Tract length, Tract weight, Ovo testis weight, shell parameters (Shell weight, Shell length, Shell width and Shell circumference) and egg number. Snail weight, organ weight, tract weight and ovo testis weight were measured with sensitive scale, while tract length, shell length, shell width and circumference were measured with tape rule. Egg number laid was manually counted after laying. Gonado Somatic Index (GSI) was also calculated as ratio of ovo testis to organ weight. At the end of eight weeks, results showed that snails fed with concentrate had higher Organ weights (119.672 ± 6.551 vs 100.278 ± 6.551 vs 78.915 ± 6.551), Tract length (23.460 ± 1.197 vs 23.270 ± 1.197 vs 19.200 ± 1.197), Tract weights (23.87 ± 1.646 vs 21.805 ± 1.646 vs 13.329 ± 1.646), Ovo testis weights (7.853 ± 0.0402 vs 7.307 ± 0.0402 vs 5.318 ± 0.0402), Shell length (11.062 ± 0.095 vs 10.467 ± 0.095 vs 10.735 ± 0.095), Shell width (6.063 ± 0.055 vs 5.765 ± 0.055 vs 5.835 ± 0.055), Shell circumference (18.559 ± 0.145 vs 17.590 ± 0.145 vs 17.725 ± 0.145) and egg number (17 vs 5 vs 0) compared to those given *mucuna* seed meal and mixture of *mucuna* seed meal and concentrate. Gonado somatic index was not significantly affected by the three feed used in this study, while those snail fed concentrate alone laid higher number of eggs compared to other feed. It was concluded from this study that concentrates support egg number, organ weight, reproductive tract development and shell increase in size. It is recommended that functionality of organ weight and reproductive tract be assessed via histological study to further evaluate the actual cellular influence of both concentrate and *Mucuna* seed meal.*

Keywords: *Mucuna pruriens*, Reproductive tract, *Archachatina marginata*, Snails

Description of Problem

Snails are derived from the wild and are used as food, feed and source of revenue in some parts of the world. Their meat is referred to as game meat or bush meat because they are actually wild animal before domestication comes in. Over the years, the number of snail harvest from the wild has dwindled due to the impact of man's activities, such as deforestation, pesticide use, slash and burn agriculture and more intensive snail hunting (1). The demand for snail meat has also increased tremendously over the years. Presently, demand for giant African land snails outstrips supply (2,3,4). As a result of the economic opportunities offered by snail farming and marketing, there is a resurgence of interest in intensive culturing of edible land snails for domestic and foreign markets (5, 6). This challenge has called for the use of feed material especially natural form of feed that can positively influence reproductive activity to boost production.

Mucuna is indeed a legume cover crop that is an efficient, low-cost source of nitrogen with considerable potential to improve soil fertility in intensified cropping systems (7, 8, 9, 10, 11). Presently, it has been reported to be of use in livestock industry in the diets of animals. The positive effect of *Mucuna pruriens* on male fertility have been demonstrated in clinical trials (12). Treatment with *Mucuna pruriens* induces secretion of the male hormone testosterone, luteinizing hormone, adrenaline, noradrenaline and dopamine in infertile male (13). It also helps to improve fertility in men by suppressing

production of prolactin. In addition, intake of *Mucuna pruriens* is linked to higher sperm count and better sperm motility (14).

Materials and Methods

Experimental Site

The research was carried out at the Snail Research Unit of the College of Animal Science and Livestock Production (COLANIM), Federal University of Agriculture, Abeokuta, Ogun State. Abeokuta lies between the rain forest vegetation zone of Western Nigeria on latitude 7°10'N, longitude 3°2'E and altitude 76m above sea level. The climate is humid with a mean annual rainfall of 1,037mm, an average temperature of 34.7°C and an imminent average humidity of 82% throughout the year (15).

Materials

A total of thirty (30) snails (*Archachatina marginata*) between 100-150g were purchased from a local farm around camp area. The other materials used are: Plastic cages (30cm by 40cm by 24cm), feeding trough, watering trough, dissecting instrument, concentrate, mucuna seed meal, Water, Digital camera, Venier caliper, Glass wears for collection of tracts, Marker and masking tape for proper identification, Taperule for measurement, Measuring sensitive scale for weight determination.

Snails and their management

The plastic cages along with the plastic feeders and drinkers were cleaned before the arrival of the snails and the commencement of the experiment. Four

weeks was set aside for the acclimatization of the snail before the experiment was carried out.

The snails were fed *ad libitum* with the three feed types that were made available during the course of the experiment. Drinking water was also given *ad libitum*. Both the feeding and the water trough were washed every day before the provision of the feed and water for each day. The experiment lasted for eight (8) weeks.

Experimental Design

Thirty snails were used for this experiment; the snails were randomly assigned into three (3) different treatments with 10 replicates for each treatment.

Treatment 1: Concentrate only

Treatment 2: Concentrate + Mucuna seed meal (1:1)

Treatment 3: Mucuna seed meal only

Parameters measured

At the end of eight (8) weeks, reproductive tract length, reproductive tract weigh, organ weight, ovo-testis weight, gonado-somatic index, egg laying pattern and shell parameters (length, weight, width and circumference) were monitored:

Experimental Procedure

After the end of eight (8) weeks, 10 snails were taken from each treatment and dissected. The parameters were then

taken. The dimension of tract was measured using tape rule. Gonado-somatic index was taken according to (16) represented by the formulae:

$$GSI = \frac{\text{Gonad Weight}}{\text{Organ weight}} \times 100$$

testis weights (P<0.001). However, experimental diet had no significant effect on Gonado-somatic index. From the result of this study, for organ weight, snails fed with concentrate had the highest means (119.672±6.551), followed by those fed with mixture of concentrate and Mucuna seed meal (100.278±6.551) while those on Mucuna seed meal only (78.915±6.551) had the least means (Table 2).

For tract length, tract weight and ovo-testis weight, concentrate and mixture of concentrate and mucuna seed meal only were not significantly different from each other but were better than those fed on mucuna seed meal only (23.460±1.197 vs 23.270±1.197 vs 19.200±1.197). The results of this study shows that concentrate had better performance on those organs measured but is contrary to the report of (18) who asserted that snails fed on concentrate performed least considering different parameter measured. It is possible that concentrate may support growth, but its effect on reproductive apparatus may not be positively influenced

Table 2: Least square means showing the effect of experimental diet on organ weight, tract length, tract weight, G S I and ovo-testis weight of *Archachatina marginata*

Treatment	Organ weight	Tract length	Tract weight	G S I	Ovo-testis weight
(T ₁)	119.672±6.551 ^a	23.460±1.197 ^a	23.871±1.646 ^a	33.580±3.127	7.853±0.0402 ^a
T ₂	100.278±6.551 ^b	23.270±1.197 ^a	21.805±1.646 ^a	35.189±3.127	7.307±0.0402 ^a
T ₃	78.915±6.551 ^c	19.200±1.197 ^b	13.329±1.646 ^b	42.477±3.127	5.318±0.0402 ^b

Table 3 and 4 showed the result of analysis of variance and least square means showing the effect of experimental diet on shell length, shell width and shell circumference of *Archachatina marginata* fed with different diet. The experimental diet had significant effect on the Shell length ($P < 0.001$). Concentrate had the highest length with means of 11.062 compared to mixture of concentrate and mucuna (10.467) while mucuna only recorded the least (10.735). Considering shell width, effect of experimental diet was also significant ($P < 0.001$). It was also recorded that concentrate had the highest means for shell width with a value of 6.063 ± 0.055 while mixture of concentrate and mucuna only were not significantly different from each other (5.765 ± 0.055 vs 5.835 ± 0.055). For shell circumference, the trend was similar to that of shell width. Concentrate had the

highest means (18.559 ± 0.145) where those snails fed mixture of concentrate and mucuna and those fed mucuna only were not significantly different ($P > 0.05$) from each other (17.590 ± 0.145 vs 17.725 ± 0.055). However, the performance of concentrate which was found to be better than those of mixture of concentrate and mucuna seed meal and mucuna seed meal only in this study is in line with the report of (19) which showed that snails fed on concentrate had appreciable shell dimension. Values reported for mixture of concentrate and mucuna seed meal and mucuna seed meal only may be due to presence of anti-nutritional factors in the diet given to this animal (20).

Also, for shell width and circumference, snails fed with concentrate also performed better than those on the two other treatments, while the two treatments were not significantly different from each other (Table 4).

Table 3: Analysis of variance showing the effect of experimental diet on shell parameters which are shell weight, shell length, shell width and shell circumference of *Archachatina marginata*

Source	DF	Shell weight (g)	Shell length (cm)	Shell width (cm)	Shell circumference (cm)
Treatment	2	139.796 NS	7.106***	1.936***	22.025***
Error` 237	237	158.221	0.729	0.242	1.684

*** $P < 0.001$; NS- not significant

Table 4: Least square means showing the effect of experimental diet on shell parameters which are shell weight, shell length, shell width and shell circumference of *Archachatina marginata*

Treatment	Shell weight	Shell length	Shell width	Shell circumference
Concentrate (T ₁)	38.248 ± 3.978	11.062 ± 0.095^a	6.063 ± 0.055^a	18.559 ± 0.145^a
Concentrate + Mucuna (T ₂)	32.475 ± 3.978	10.467 ± 0.095^b	5.765 ± 0.055^b	17.590 ± 0.145^b
Mucuna only (T ₃)	39.478 ± 3.978	10.735 ± 0.095^c	5.835 ± 0.055^b	17.725 ± 0.145^b

This observation may be as a result of rich energy and protein contained in the feed which support growth. Those contained in mucuna may not be readily available or affected by the presence of anti-nutritional factors in the feed (20).

Table 5 shows egg laying pattern across the weeks of the experiment. In all, snails fed on concentrate had the highest number of eggs (17) compared to those fed with the mixture (concentrate and mucuna seed meal) while those on

mucuna seed meal only did not lay at all. For egg laying, no turn out of eggs was recorded for those fed with mucuna seed meal alone which contradict the report of (21) who asserted that mucuna seed extract at higher dosage has positive effect on egg production. The negative effect seen in the study may as a result of anti-nutritional factors present in the seed. If the seed is processed appropriately, positive results may be achieved.

Table 5: Showing the egg laying pattern of the snails fed on three experimental diets (*Archachatina marginata*)

Weeks	Concentrate	Concentrate + Mucuna	Mucuna only
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	7	0	0
6	5	0	0
7	0	0	0
8	5	5	0
Total	17	5	0

Conclusion and Application

The result of this study showed that

1. Concentrate had positive influence on reproductive tract dimension, shell parameter, organ weight and egg laying performance compared to Mucuna which had been reported to positively influenced reproduction and growth of livestock.
2. It was however recommended that histology of the complete tract be

carried out especially that of oov-testis to further assess the cellular functionality of the feed given to snails.

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