FUOYE Journal of Pure and Applied Sciences

Available online at www.fuoye.edu.ng

EVALUATION OF SOIL MOISTURE AND SPECIES DIFFERENCE ON SPERM AND OVA COUNT OF THE GIANT AFRICAN LAND SNAILS IN DIFFERENT SEASON

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ARTICLE INFO

Received: 10 November 2017
Accepted: 15 February 2018

Keywords:
Soil moisture, Species, Ova count, Sperm count, Giant African Land Snails

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Abstract

The experiment investigates the effect of soil moisture and species differences on the sperm and ova count of the Giant African Land Snails in different season. A total of 48 snails per species weighing between 100 and 200g were exposed to two different soil moisture levels with 6 snails of each species per replicate over a period of 52 weeks. At the end of each season, snails from each species and soil moisture level were randomly selected for dissection to obtain the reproductive tracts and each of the organs observed was lacerated and mixed with 5 ml of saline water, the mixture was observed under microscope for the sperm and ova count. No significant seasonal differences ($P>0.05$) were observed on the ova and sperm counts. Significant species effects ($P<0.05$) was observed on ova counts (0.521 and 1.105) but not for sperm count ($P>0.05$) for Achatina achatina and Archachatina marginata respectively. Significant soil moisture level differences ($P<0.01$) were observed on ova counts (0.543 and 1.083) but not for sperm count ($P>0.05$) for snails in the low and high soil moisture conditions, respectively. There was significant interaction between soil moisture level and season for sperm count ($P<0.01$); between the soil moisture and species for sperm count ($P<0.05$), while sperm count was higher in low soil moisture condition for A. achatina. There was no significant interaction between season and species; and between season, soil moisture and species for ova and sperm count ($P>0.05$).

1.0 Introduction

There is surge in the interest in the snail farming in Nigeria, judging by the number of backyard snail farm being set up particularly by the small scale farms in the Southern part of the country. [1] and [2] noted that some Nigerians were rearing *Archachatina marginata* in gardens behind their houses, mostly for subsistence. The interest in snail farming is currently being dampened by the inconsistencies of the productive and reproductive response of the snails through the year which is basically affected by the seasonal factor and soil moisture. However, snails have been said to be a seasonal producer: they produce only during the raining season. This statement does not have scientific data to back the claim hence the need for this study. This is only achievable if the soil moisture level is monitored or controlled all year round or all seasons to investigate the effect on the snail reproductive performance.

2.0 Materials and Methods

The experiment was carried out at the Snail Physiology Research Unit of the College of Animal Science and Livestock Production, University of Agriculture, Abeokuta situated within the rain forest belt of Nigeria, latitude $7^0 10'$ N, longitude $3^0 2'$ E and altitude 760 metres above sea level with a mean annual rainfall of 1,037 mm, mean temperature of 34.7 ^{0}C and mean relative humidity of 82 % [3]. A total of 96 snails weighing between 100 and 200 g were used. 48 *Achatina achatina* and 48 *Archachatina marginata* snails were exposed to two different soil moisture levels in 4 replicates, with 6 snails of each species per replicate in different cages over a period of 52 weeks. The seasons were classified into 4 based on the data obtained from Ogun – Osun River Basin Development Authority, Abeokuta weather station as follows:

Cold dry	24th October – 29th December
Hot dry	29th December – 23rd March
Hot wet	23rd March – 20th May
Cold wet	20th May - 24th October

The different soil moisture levels were obtained thus: The top humus soil obtained from the farm site in the University was oven-dried at 82^0C. Each plastic cage of 40cm x 30cm x10cm dimension was filled with top humus soil of 1.65kg and sprinkled with 400ml of water initially to attain 25% soil moisture. Cages on low soil moisture treatment were sprinkled with 25ml of water each week while cages on high soil moisture treatment were each sprinkled with 100ml of water each week.

The snails were fed a mixture of layer mash and grounded pawpaw leaves daily on ration1:1, the proximate analysis of the mixed feed indicates that the feed contains dry matter (91%), crude protein (20.51%), crude fibre (4.85%), ether extract (4.6%), ash (7.63%) and moisture (10.5%) as presented in Table 1. The feed and water were provided in plastic troughs *ad libitum*. Daily routine cleaning was carried out while the soil was changed on monthly basis and refilled before subjecting it to the 25% soil moisture treatment. At the end of each season, snails from each species and soil moisture level were randomly selected for dissection. Prior to dissection, the final live weight of each of the snails were determined after which the shell was removed and dissection was carried out according to the procedure of [4]. The removal of the reproductive tracts was carried out by a median dorsal incision on the head region through the mouth which was made to separate the reproductive tracts from the alimentary canal. The convoluted little hermaphrodite duct was carefully removed.

The course of the little hermaphrodite duct was carefully traced to the ovo-testis, which in matured snails is usually a small white lobulated gland situated at the apex of the visceral lump. The colour, size and volume of the ovo-testis was identified and measured as described by [5]. Each of the organs observed was lacerated and mixed with 5 ml of saline water, the mixture was taken with micro pipette and place on the slide. The slide was stained and observed under microscope for the sperm and ova count. The grading of the sperm and ova counts was coded: Very many (4), Many (3), Few (2), Very few (1), None (0). Data were subjected to the least squares analysis of variance (ANOVA) procedure using Systat Analytical Computer Pack Version 5.02 [6].

3.0 Results and Discussion

Table 1 gives the results for proximate composition of the experimental feed while figures 1 and 2 show the effect of soil moisture level on number of clutches of egg laid by *A.marginata* and the effect of species on ova count in the parts of the ovotestis of *A. achatina* and *A. marginata* respectively. However, the effects of soil moisture level on the sperm count in the parts of the hermaphrodite duct of *A. achatina* and *A. marginata* interactive effect of season and that soil moisture level on the sperm count in the parts of the hermaphrodite duct of *A. achatina* and *A. marginata* are described in figures 3 and 4 respectively.

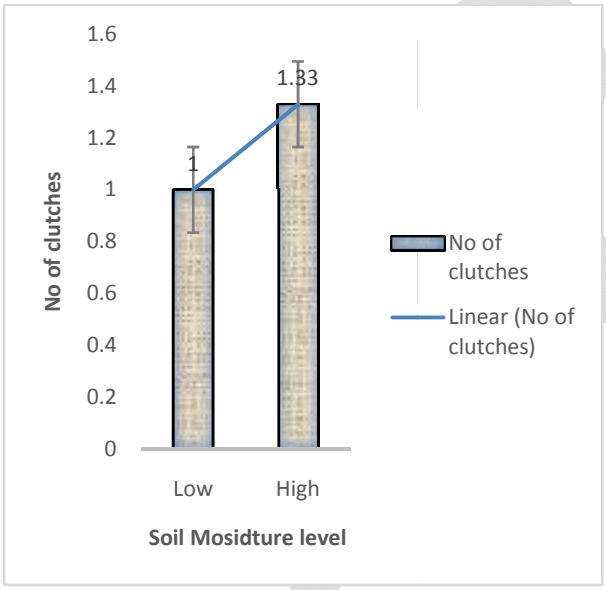

Figure 1: Effect of soil moisture level on number of clutches of egg laid by *A.marginata*

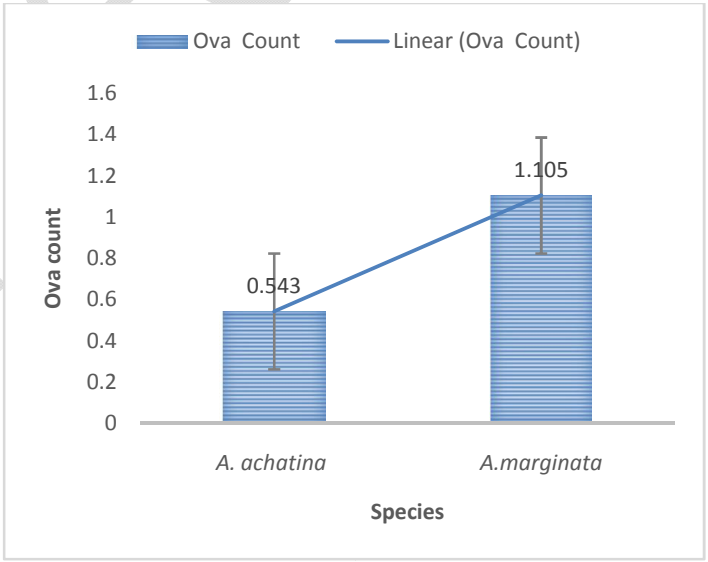

Figure 2: Effect of species on ova count in the parts of the ovotestis of *A. achatina* and *A. marginata*

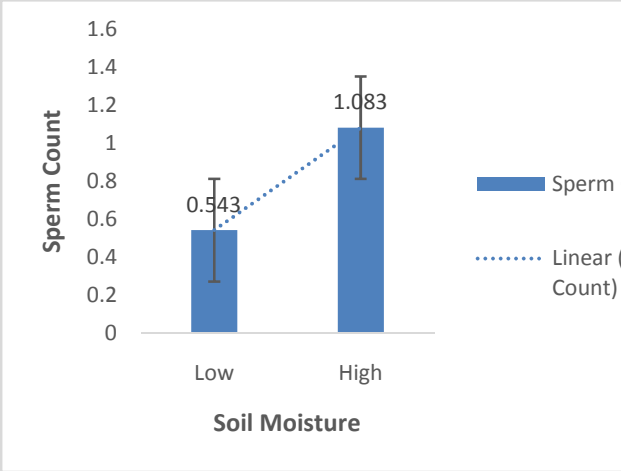

Figure 3. Effect of soil moisture level on the sperm count in the parts of the hermaphrodite duct of *A. achatina* and *A. marginata*

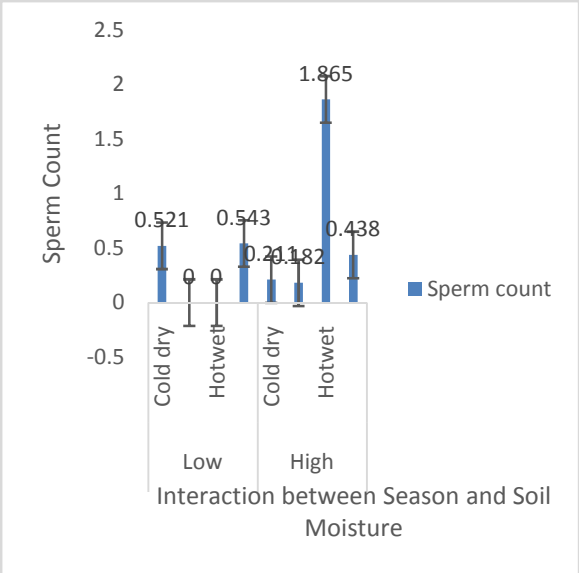

Figure 4. Interactive effect of season and soil moisture level on the sperm count in the parts of the hermaphrodite duct of *A. achatina* and *A. marginata*

Significant soil moisture level differences (P<0.01) were observed on number of clutches (1.0 and 1.33) for snails in the low and high soil moisture conditions, respectively (Figure 1). There was no significant seasonal differences (P>0.05) observed on the ova and sperm counts. Significant species effects (P<0.05) was observed on ova counts (0.521 and 1.105) but not for sperm count (P>0.05) for *A. achatina* and *A. marginata* respectively as presented in Figure 2. In Figure 3, significant soil moisture level differences (P<0.01) were observed on ova counts (0.543 and 1.083) but not for sperm count (P>0.05) for snails in the low and high soil moisture conditions, respectively. There was significant interaction between soil moisture level and season for sperm count (P<0.01) which was due to the fact that the sperm count was highest in the hot wet season at high soil moisture condition. There was significant interaction between the soil moisture and species for sperm count (P<0.05), which was due to the fact the sperm count was higher in high soil moisture condition for *A. marginata* whereas sperm count was higher in low soil moisture condition for *A. achatina.* There was no significant interaction between season and species; and between season, soil moisture and species for ova and sperm count (P>0.05). There was an interactive effect of season and soil moisture level on the sperm count in the parts of the hermaphrodite duct of *A. achatina* and *A. marginata* (P<0.05) with higher sperm count in the hermaphrodite duct during all the season except during the cold dry season in the snails nurtured on the high moisture soil (Figure 4).

The report by Akinnusi [2] that snail laying performance is affected by season and species, and that *A. achatina* lay 100 -300 small eggs, one to three timesin each growing season. While *A. marginata* lay from 5 - 10 large eggs four to eight times egg growing season disagree with this study while in this study, *A. achatina* did not lay eggs and the factor(s) responsible for this result is not known. *A. marginata* laid large eggs and average of 6.89 clutch size. In this study, the larger clutch size recorded for

snails on the high soil moisture condition compared to those on the low soil moisture condition may be due to the facts that snails are active on soil with high soil level. Although, the report of [7] that good laying performance in the Giant African Land Snails during the month of June and July when the rain is at its peak indicates high soil moisture condition which enhances for ideal physiological status that enhances a good reproductive performances. The result of the study showed that spermatozoa counts was highest in the hot wet season, followed by cold wet, cold dry and hot dry season respectively which indicate that spermatozoa count was higher in the dry season which was similar to the observation made by [8] that a significantly low spermatozoa count was recorded in pacific oyster during the wet season.

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