# EFFECT OF RELATIVE HUMIDITY AND TEMPERATURE ON REPRODUCTIVE PERFORMANCE OF AFRICAN GIANT LAND SNAILS (*ARCHACHATINA MARGINATA*) REARED UNDER INTENSIVE MANAGEMENT DURING DRY SEASON

**Otunla, T. A., Oyedele, O. J., Osanaiye, F.G., Olu, F.O. and Olosunde, A. O.**
Bioresources Development Centre Ogbomoso, National Biotechnology Agency, Abuja
Klm 5, Iresaapa/Ogbomoso Road, Onipanu, Ogbomoso, Oyo State, Nigeria
**Corresponding author: otunlataiwo@gmail.com, +2348030448852*

**ABSTRACT**
*Forty eight growing African Giant Land Snails (Archachatina marginata) between average weight of 400 to 600 grams were used to evaluate the effect of relative humidity and temperature on egg production. The experiment lasted for 20 weeks (December-April) with eight snails per cage. The temperature and relative humidity of the ambient environment of the snail cages were recorded in the morning and afternoon using Omsons dry and wet hygrometer. Higher average daily temperature (310C) was observed in the afternoon (12pm) compared with the 8am in the morning (220C) while, the average relative humidity (92%) was recorded in the morning 8am compared with (61%) in the afternoon (12pm). A zig-zig egg laying pattern was observed across all the cages throughout the experimental period which suggest that snails observed a break period in egg laying. Fluctuation in relative humidity and temperature had a great influence on egg production of A. marginata; for optimum egg production relative humidity of above 80% and temperature 25–300C are recommended. It was concluded that snails provided with high humid condition during dry season can attain optimum reproductive performance all year round under intensive management system.*
**Keywords: Snails, relative humidity, temperature, dry season and egg production,**

## INTRODUCTION

Success in snail production involves proper and optimum environmental condition that can meet its growth and reproductive requirements. The major environmental factors affecting Giant African Snails are temperature, photoperiod, humidity, water, space/transpacific competition, soil, shelter and food (Nnodim and Ekpo, 2019). The cyclic biological mechanism of activeness of snail during wet season and inactiveness in the dry season was as a result of changes in moisture and relative humidity in a year. Dryness inhibits growth and even stops activity of snails (Oyeagu *et al*., 2022). The center for heliculture recommended 65-75 % humidity during the day and 85-95 % at night at 20°C. In any event, humidity higher than 95% should be avoided. Excessive humidity can kill snails. The percentage cumulative body weight gain of *Archachatina marginata* that is raised under very high humidity was highest when compared to medium and low levels of humidity (Oyeagu *et al*., 2022). For commercial productions, eggs must be produced throughout the year. If aestivation can be prevented, production of snails is likely to increase during the dry season. Domestication and intensive management of the edible land snail is inevitable in order to combat the great demand on the conventional animal protein food leading to their exorbitant prices and thus becoming unaffordable to some average Nigerians (Onunkwo *et al*., 2019). Therefore animal protein intake can be increase through exploiting the potentials of non-conventional animal protein sources like snail. Though, research in the tropics on climate change has focused more on crops, less on livestock and little on biodiversity conservation. This study was therefore, sought to identify the effect of immediate relative humidity and temperature on snail reproductive performance (in term of egg production) all year round under intensive management system.

## MATERIALS AND METHODS

The experiment was conducted at the Snailery unit of Bioresources Development Centre Ogbomoso, Oyo State, within the derived Savannah Zone of Nigeria. The agro-ecological description of the study area has been documented by Oguntoyinbo (1988). The rainy season is between April – October and dry season between November – March with annual rainfall range of 1680 – 1700mm (Breinholt *et al*., 1981). African giant land snails (*Archachatina marginata*) were used in the experiment. The

growing snails were purchased from Iresapa Market around Ogbomoso and used for the study which lasted for 5 months (December-April). Wood shavings collected from sawmill around was sterilized and used as the rearing medium. Sterilization was done using hot water treatment. Water was heated to 100ºC and then poured into the medium (wood shavings) to its level in the drum and left for an hour on fire. The water was later drained after cooling. Then the sterilized wood shavings was spread into the experimental pen as bedding and filled up to 5cm depth. The snails were characterized and separated into various pen tagged with cardboard paper as labels. The snails were fed with the natural diet (vegetables) and acclimatized for two weeks before the commencement of the experiment. The pens were kept cool by sprinkling with water to prevent dryness. The temperature and relative humidity of the ambient environment in morning and afternoon was monitored using Omsons dry and wet hygrometer. After acclimatization, the snails were fed *ad-libitum* with vegetables (moringa leaves, pawpaw fruit and pawpaw leaves) supplemented with concentrate diet (layers mash) thrice in a week and were provided clean water in the morning (between 8am-9am). The bedding materials were changed monthly. The feed was moistened before supply to allow for easy ingestion and to prevent respiratory difficulty that can be caused by dusty feed. Their reproductive performance records were taken in terms of egg laying (weekly egg clutches per cage).

**Table 1: Composition of experiment diet (g/100 g)**

| **Ingredients** | **Composition (%)** |
|---|---|
| Maize | 40.00 |
| Groundnut cake | 20.00 |
| Wheat offal | 31.75 |
| Bone meal | 5.00 |
| Oyster shell | 3.00 |
| Vitamin premix | 0.25 |
| Total | 100 |
| **Calculated anlysis** | |
| ME (Kcal/Kg) | 2,474.53 |
| Crude protein (%) | 17.63 |
| Ether Extract (%) | 3.91 |
| Crude fibre (%) | 4.50 |
| Calcium (%) | 2.98 |
| Phosphorus (%) | 0.93 |
| Cost/Kg of feed (₦) | 100.00 |

**RESULTS AND DISCUSSION**

Inverse relationship occurred between relative humidity and temperature as shown in Figure 1. Relative humidity increases as temperature decreases. The time of day had effects on temperature and relative humidity. Higher average daily temperature was recorded in the afternoon (12pm) compared with the morning (8am). Average relative humidity was higher at 8am (morning) than 12pm (afternoon). This may account for snails' egg laying in cool time of the day during the observation. This agrees with report of Oyeagu *et al*., 2022 that snails mated chiefly at night while egg laying usually occurs in the evening, night on warm days. Figure 2 shows the weekly egg production of the snails per cage. From this study, a zig-zig egg laying pattern was observed across all the cages throughout the experimental period which suggest that snails observed a break period in egg laying in which they rest (|Figure 2). Fluctuation in relative humidity and temperature had a great influence on egg production of *A. marginata*; with almost all the snails producing eggs during stable relative humidity and temperature (Figure 3). This suggest that snail adjust to prevalent climatic conditions in order to maintain homeostatic balance which affect nutrient utilization for other body functions such as egg production. Though there was production throughout the period, it was reduced at the period of high temperature and low relative humidity during the experiment.

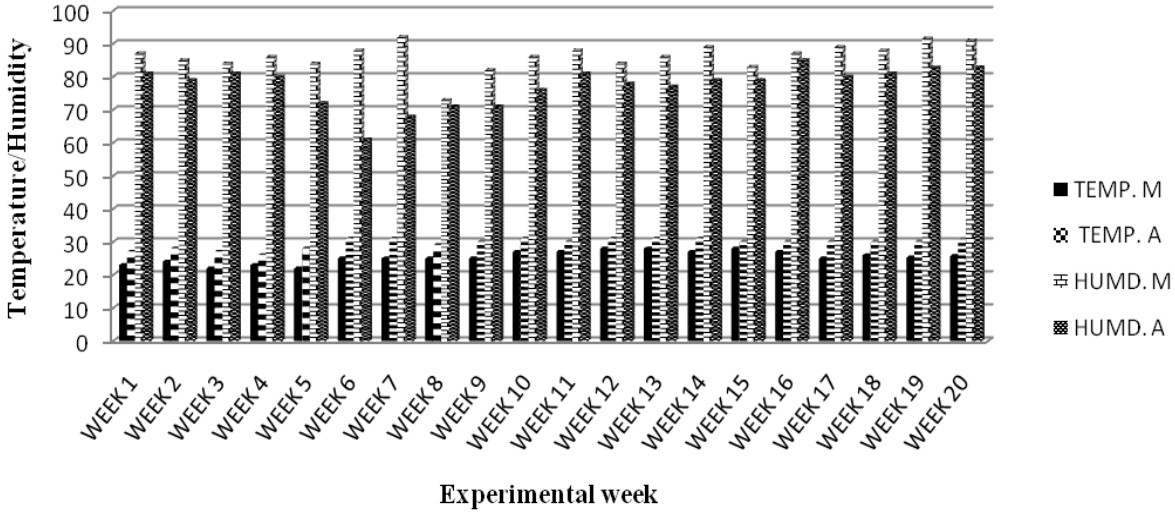


**Figure 1: Effect of time of the day on temperature and humidity**

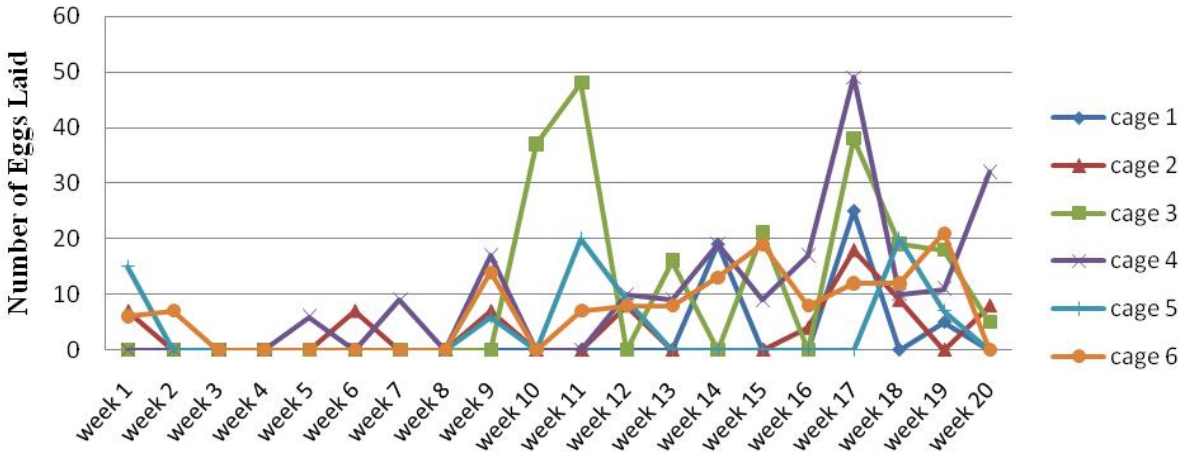


**Figure 2: Weekly egg production of snails per cage**

This is in line with the observation of (Bloszyk *et al.,* 2016) that growth and reproductive rates of snails increase in the dry season when high humidity is provided. Oyeagu *et al*., 2022 reported that snails can reproduce throughout the year if favourable humidity and adequate soil moisture are stimulated in the rearing unit and snails can be raised indoors at 21°C with relative humidity of 80% to 95%.

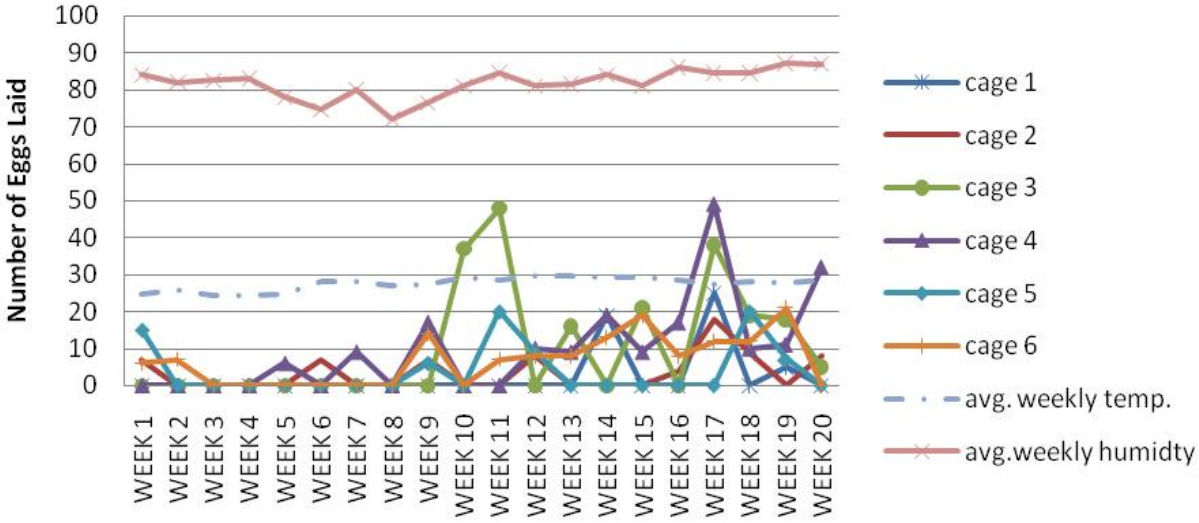


**Figure 3: Effect of temperature and humidity on weekly egg production**

## CONCLUSION

Based on this study, *A marginata* can be reared using a humidifier as a source of increasing the humidity to provide high humid condition in the dry season to attain optimum reproductive performance all year round under intensive management system.

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