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# EFFECTS OF LACTATIONAL EXPOSURE TO AQUEOUS SOLUTION OF ALLIGATOR PEPPER (*Elettaria cardamomum*) ON LITTERS OF LACTATING WISTAR RATS

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**ABSTRACT**

This study was designed to investigate the effects of aqueous solution of alligator pepper on the litters of lactating rats whose mothers were fed with various doses of the product. Forty lactating wistar rats with a collective litter size of 180 rats were used for the study. The lactating rats were separated into four groups (A.B,C and O) with a sample size of ten lactating rats per group. The lactating rats with their litters adjusted to between four and five were housed in separate maternity cages and fed liberally with normal rat chow and water. The lactating rat groups A, B, and C were administered 0.7mg/kg 1.4mg/kg and 2.8mg/kg of aqueous solution of alligator pepper respectively. The control group (O), received only water. The rats whose mean weight was 200g received the treatments by oral intubations between the hours of 9am and 10 am daily for 10 days with effect from the day they delivered their litters. The litters were observed and weighed on daily basis. The results showed that the litters of the control group O animals, had a significantly higher($P<0.05$) growth rate than the litters of groups A, B and C. The group A litters also had a higher growth rate than group B litters whose mean growth rate was significantly higher ($P<0.05$) than litters of group C rats.

**Key words:** Alligator pepper, Wistar rats, Litters, Growth rate, Lactating rats.

## INTRODUCTION

The alligator pepper (*Elettaria cardamomum*), a tropical herbaceous perennial plant is of the genus-*Elettaria*, and belongs to the family, zingiberracea of the angiosperms in the kingdom plantae (Capuco AV & Akers RM, 2009). The plant is widely grown in West African countries including Nigeria, Liberia, Ghana, Togo, etc

In Nigeria (especially South-east), the seed of alligator pepper is said to have medicinal, nutritive, traditional and economic values. It is therefore used as a stimulant, masticatory and carminative by many including lactating/nursing mothers who do not know whether the product has an effect on their infants health (Nwobi IO, 1992).

Some other innocent but ignorant nursing mothers also find a good use of alligator pepper as a hot spice that fits in different applications – medicinal cultural, entertainment, brewing, economic and flavouring purposes. In Igbo land (Nigeria) where this study was done, alligator pepper is usually used to entertain guests, especially in the cool evenings and morning hours when it is served along with palm wine or local gin to attain a satisfying excitement and euphoria.

It has been observed in our earlier study that alligator pepper reduced prolactin secretion in lactating wistar rats. Prolactin, a peptide hormone is primarily associated with lactation (secretion of breast milk) which provides the primary source of nutrition and immunity for new borns before they are able to eat and digest other foods (Essien RG, 1994).

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The breast milk which has been demonstrated to contain fat, protein, carbohydrate, minerals, etc., helps the newborn to achieve normal growth and development when properly fed with normal quantity and quality milk produced by the mother. This study therefore seeks to investigate how alligator pepper ingestion by lactating wistar rats affects the growth and development of the litters.

## MATERIALS AND METHODS

Sixty-two month old female (mean weight = 200g) and thirty-two month old male (mean weight = 210g) wistar rats procured from a commercial animal house in Owerri, Imo State of Nigeria were introduced into the animal house of the Department of Anatomy and Neurobiology, Imo State University, Owerri. The virgin animals were separated cages from the males to prevent pregnancy occurrence before delivery into the university animal house where they were allowed a 21-day acclimatization period. A male rat was introduced into each cage housing two female rats and allowed to cohabit the cage until pregnancy was diagnosed of the majority of the rats. The males were then withdrawn and each pregnant rat placed in a separate cage. Between the 21$^{st}$ and 22$^{nd}$ days of confirmation of pregnancy, 47 of the rats littered and 40 were separated for the experiment. The litter size (number) per rat ranged between three and seven, and to ensure each of the mother rats suckled approximately same number of litters, the litter size per mother rat was adjusted to between four and five as soon as they were delivered.

Both the mother rats & their litters were weighed individually and their weights noted before commencement of treatment with aqueous solution of alligator pepper.

The forty maternity cages were then divided into four groups coded A, B, C and O. A litter size of 38 to 40 was contained in each group. The mother rats were fed liberally with normal rat chow and water to sustain normal milk secretion. With the aid of orogastric tube, the group A mother rats were administered O.7ml, group B – 1.4ml, and group , 2.8mls (all per kg/bw) of the alligator pepper solution between 9 and 10 am daily before routine feeding with normal rat chow and water for a period of 10 days. The control group O, received only distilled water for same period of time.

Behavioural manifestations and weights of the individual litters in the respective experimental and control groups were noted on daily basis. It is the behavioural and physical manifestations of the litters of the different groups treated with aqueous solution of alligator pepper and the body weights of the litters (used to determine their growth rate) that formed the result of this experiment.

## RESULTS

**Results are reported in the tables below**

The results showed that the growth rate of litters of the different animal groups was not uniform. Some groups developed and grew more than others and the F-ratio was significant.

**Table 1. Body weights and growth rates of the litters at birth and after 10 days of treatment of the mother rats respectively**

| Control Group Litters n = 20 | | | Group "A" Litters n = 20 | | | Group "B" Litters n = 20 | | | Group "C" Litters n = 20 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| At birth | At day 10 | Growth Rate | At birth | At day 10 | Growth Rate | At birth | At day 10 | Growth Rate | At birth | At day 10 | Growth Rate |
| 4.70 | 15.50 | 1.08 | 5.00 | 14.80 | 0.98 | 4.80 | 14.20 | 0.94 | 4.70 | 12.00 | 0.73 |
| 4.90 | 15.10 | 1.02 | 4.80 | 14.50 | 0.97 | 4.70 | 14.00 | 0.93 | 4.70 | 12.50 | 0.78 |
| 4.70 | 16.00 | 1.13 | 4.60 | 15.00 | 1.04 | 5.00 | 14.00 | 0.90 | 4.80 | 11.80 | 0.70 |
| 4.60 | 15.50 | 1.09 | 4.90 | 14.30 | 0.94 | 4.50 | 14.00 | 0.95 | 4.60 | 12.30 | 0.77 |
| 4.70 | 15.50 | 1.08 | 4.60 | 14.50 | 0.99 | 4.80 | 13.50 | 0.87 | 4.90 | 12.50 | 0.76 |
| 4.80 | 15.00 | 1.02 | 4.70 | 14.20 | 0.95 | 4.70 | 14.00 | 0.93 | 4.70 | 12.00 | 0.73 |
| 4.70 | 16.00 | 1.13 | 4.70 | 14.50 | 0.98 | 4.90 | 13.70 | 0.88 | 4.70 | 11.70 | 0.70 |
| 4.90 | 16.00 | 1.11 | 5.00 | 14.70 | 0.97 | 4.90 | 13.40 | 0.85 | 4.80 | 12.00 | 0.72 |
| 4.90 | 14.50 | 0.96 | 4.80 | 14.80 | 1.00 | 4.60 | 13.70 | 0.91 | 4.80 | 12.00 | 0.72 |
| 5.00 | 15.00 | 1.00 | 4.80 | 14.40 | 0.96 | 4.80 | 13.70 | 0.89 | 4.60 | 11.80 | 0.72 |
| 4.90 | 15.30 | 1.04 | 4.70 | 14.00 | 0.93 | 4.70 | 14.00 | 0.93 | 4.70 | 11.80 | 0.71 |
| 4.80 | 14.80 | 1.00 | 4.60 | 14.50 | 0.99 | 4.70 | 14.10 | 0.94 | 5.00 | 12.60 | 0.76 |
| 5.00 | 15.00 | 1.00 | 4.80 | 14.50 | 0.97 | 4.80 | 13.60 | 0.88 | 4.90 | 12.50 | 0.76 |
| 4.60 | 15.20 | 1.06 | 4.90 | 14.80 | 0.99 | 4.80 | 13.60 | 0.88 | 5.00 | 12.50 | 0.75 |
| 4.80 | 15.30 | 1.05 | 5.00 | 14.80 | 0.98 | 4.50 | 13.70 | 0.92 | 4.80 | 12.30 | 0.75 |
| 4.70 | 15.20 | 1.05 | 4.80 | 14.30 | 0.95 | 4.60 | 13.60 | 0.90 | 4.90 | 12.40 | 0.75 |
| 4.80 | 15.80 | 1.10 | 4.80 | 14.10 | 0.93 | 5.40 | 13.80 | 0.84 | 4.90 | 12.00 | 0.71 |
| 4.80 | 14.80 | 1.00 | 4.90 | 14.30 | 0.94 | 4.80 | 13.80 | 0.90 | 4.80 | 12.30 | 0.75 |
| 4.60 | 15.00 | 1.04 | 4.90 | 14.30 | 0.94 | 4.80 | 13.90 | 0.91 | 4.70 | 12.50 | 0.78 |
| 4.70 | 15.50 | 1.08 | 4.70 | 14.70 | 1.00 | 4.80 | 13.70 | 0.89 | 4.80 | 12.50 | 0.77 |
| **Mean Growth Rate** | | 1.05 | 0.97 | | | 0.90 | | | 0.74 | | |
| **±Standard Deviation** | | ± 0.05 | ± 0.03 | | | ± 0.03 | | | ± 0.03 | | |

**Table 2. Difference between growth rate of litter groups after 10 days**

| Groups | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | Lower | Upper | | | |
| **Control (O) Growth Rate vs-Group A Growth Rate** | 0.08200 | 0.05064 | 0.01132 | 0.05830 | 0.10570 | 7.242 | 19 | 0.000 |
| **Control (O) Growth Rate vs-Group B Growth Rate** | 0.15000 | 0.06473 | 0.01447 | 0.11971 | 0.18029 | 10.364 | 19 | 0.000 |
| **Control (O) Growth Rate vs-Group C Growth Rate** | 0.31100 | 0.06112 | 0.01367 | 0.28239 | 0.33961 | 22.755 | 19 | 0.000 |
| **Group A Growth Rate vs-Group B Growth Rate** | 0.06800 | 0.04238 | 0.00948 | 0.04817 | 0.08783 | 7.176 | 19 | 0.000 |
| **Group B Growth Rate vs-Group C Growth Rate** | 0.16100 | 0.03339 | 0.00747 | 0.14537 | 0.17663 | 21.565 | 19 | 0.000 |
| **Group A Growth Rate vs-Group C Growth Rate** | 0.22900 | 0.04064 | 0.00909 | 0.20998 | 0.24802 | 25.200 | 19 | 0.000 |

## DISCUSSION

With the presence of normal levels of prolactin, and corresponding normal yield and secretion of milk, the control group litters were all healthy. These litters received continuous and sufficient supply of milk rich in casein, lactose, lipids and other nutrients required for normal growth (Noel GL *et al*., 1984). The litters of this group had a significant higher mean growth rate (GR = 1.05g) within 10 days when compared with the other groups, especially groups B and C litters whose mothers received respective higher doses of aqueous solution of alligator pepper.

The litters of group A rats treated with 0.7mg.kg body weight of aqueous solution of alligator pepper were morphologically similar to the control group litters, as there were no noticeable or observable changes in their appearance, and the difference in the mean growth rate (GR=0.97±0.03) of the two groups was also minimal. A possible explanation to this is that the dose or quantity of alligator pepper administered to group A mother rats was not potent enough to produce observable morphologic, physiological and or anatomical changes in the litters exposed to their breast milks. This finding is in agreement with the works of Igwe et al 1990 from whose report it was calculated that the quantity of aqueous solution of alligator pepper (mg/kg body weight) that could produce a pharmacological effect on the body tissues when consumed is 1.4mg/kg body weight for a 200g wistar rat. The group B litters whose mothers were fed with 1.4mg/kg body weight of the product had a mean growth rate of 0.90 ± 0.03, which was lower than that of group A litters but yet higher than that of group C (0.74 ± 0.03) whose mothers were fed with the highest dose of aqueous solution of alligator pepper (2.8mg/kg) for 10 days.

The statistical analysis result summarized the finding in this order: That there was a significant increase ($P<0.05$) in growth rate observed among the control group litters over those of groups A, B, and C and that the growth rate of group A litters was significantly higher than those of groups B and C correspondingly, the growth rate of group B litters was significantly higher than that of the group C litters. Signs of debilitation among the litters of the treated animals could be perceived by careful observation of the external appearance and the behavior of the litters especially the group C as tremors and loss of balance were observed in the behavioural pattern of the group C litters mainly. These findings point to the fact that the group **C** lactating rats were most affected by the suppressive effect of alligator pepper on milk secretion, thereby exposing the litters to insufficient milk intake which certainly affected their nutritional status leading to poor development and stunted growth.

## CONCLUSION

Alligator pepper (*Elettaria cardamomum*) when consumed in high doses by lactating wistar rats caused suppression of milk secretion and subsequent malnutrition of the litters.

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