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EFFECTS OF ZINC SUPPLEMENT ON RABBITS PERFORMANCE AND GROWTH RATE

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ABSTRACT
Improvement on the quantity and quality of non traditional animal protein sources has become necessary in order to meet the need for adequate food and nutrition action plans of government at all level to ensure consistent and continuous supply of basic health need such as protein, vitamins and energy food. Dietary supplementation of rabbits with zinc was carried out to determine its effects on reproduction performance and growth rate of rabbits. Fifteen adult does were randomly assigned to 3 groups of 5 rabbits per group: the control group and two treatments groups. The control group was not supplemented with zinc while treatment groups A and B were supplemented with zinc of 20µg and 40µg respectively for 60 days. Zinc enhanced increase in litter size of treatment groups that recorded 25 and 22 kittens for 20µg and 40µg respectively against 7 kittens for the control. The difference was statistically significant at P <0.001. Though, there was geometric increase in size and weight in all the groups following weaning but the growth rate was independent of zinc treatment. Mortality was 60% and 81.87% among kittens kindled by does supplemented with 20µg and 40µg of zinc respectively against 42.86% of the control does. It is not unlikely that adaptive immunity from mammary gland of does fortified with zinc impacted the kittens and improved their survival rate.

Keywords: Growth rate, kittens, reproduction performance, zinc supplement,

INTRODUCTION
Malnutrition is like an iceberg; most people in the developing countries live under the burden of malnutrition. Pregnant women, nursing mothers and children are particularly vulnerable to the effects of malnutrition. The adverse effects of maternal malnutrition have been well documented – maternal depletion, low birth weight, anaemia, pregnancy toxaemias, post-partum haemorrhage, all leading to high mortality and morbidity. The effects of malnutrition are also frequently more serious during the formative years of life (Park, 2007).

Among other nutritional problems in public health are low birth weight and protein energy malnutrition, it is not only an important cause of childhood morbidity and mortality, but leads also to permanent impairment of physical and possibly, of mental growth of those who survive (ICMR, 1990). Meanwhile, the problem of protein energy malnutrition still remain, there is therefore, the need for adequate food and nutrition action plans by government at all levels to ensure consistent and continuous supply of basic health need such as protein, vitamins and energy food sources, and to overcome the animal protein insufficiency, there is need to improve on the reproductive performance and growth rate of livestock, thereby contributing to the value of traditional and non-traditional meat sources such as rabbits for small scale farmers to rear for their meat and other by products.

Rabbits production and consumption in Nigeria as a livestock is fast gaining acceptance and popularity in the sub-humid zone, they have a high feed conservation ratio

and are efficient converter of plant products and seeds (Asuquo, 2007). The meat is rich in protein, compared to meat of other small species. But its production is limited by the expensive nature of pellet feed whose micro mineral content is unknown and which is out of reach to local livestock farmer (Dairo and Ojekale, 2004). The role of micro mineral in health cannot be over emphasized, zinc been a modifier of wide spectrum of biological activities and its deficiency has been related to various dysfunctions and alterations of normal cell metabolism. Thus, supplementation of rabbits with zinc salt was considered in this study to determine it effects on reproduction performance and growth rate of rabbits with the aim of improving quality and quantity of non tradition meat source of protein available to the consumers.

MATERIALS AND METHODS

Laboratory Animal

Fifteen adult female rabbits (does) of cross breed of New Zealand white and California white, aged 6 months old (with mean weight of 2.00kg) were obtained from Institute of Agricultural Research and Training (IART) Ibadan. The rabbits were assigned using a complete randomised design, to three different treatment groups of 5 rabbits per treatment and were housed in different nest cages of wire mesh with dimension of 1.2m by 0.6m per rabbit. The cages were open sided for cross ventilations. Quarantine was for 30days and there were no observable disease symptoms before the commencement of the experiment. For the entire period of the study, the rabbits were fed with pellets containing insignificant quantity of zinc from Bendel feed mill, Ewu and complemented with green feeds and water given *ad libitum.*

Treatment: Group A and B were supplemented with 20µg/kg of feed and 40µg/kg of feed of zinc salt respectively for 60 days and group C (control) had no dietary zinc supplementation. The treatment dosage was chosen in relation to the values obtained from human population studies carried out elsewhere (Park, 2007). Three bucks of the same litter from IART (1 per group) were made to serve the groups on the same day. The daily weight gain was measured using five goats $^{@}$ (China) Weighing machine. The kittens were fed with breast milk from the does in their respective cages before they were weaned at 30 days and statistical analyses of data were conducted using chi-squeal and analysis of variance.

RESULTS

There was a significant increase in weight gain by the does following conception which is a normal development in gestation (table 1). It was also observed that zinc enhanced the increase in the litter size of the treatment groups that recorded 25 and 22 kittens for 20µg and 40µg of zinc supplementation groups respectively, against 7 kittens for the control group that was not supplemented with zinc. The difference in litter size among treatment groups and control group was statistically significant at $P < 0.001$. Mortality was lowest among treatment group of 40µl followed by 20µl but was high among the control group which recorded 42.86%, the difference in mortality among the treatment groups was concentration dependent and the mean birth weight of the kindle from the treatment group was not statistically significantly different from those of the control group ($P < 0.05$).

Table 2 shows the effect of zinc on weight gain pattern of kittens in all the three groups. The growth rate was progressive in both treatment and control groups but it was more pronounced in the group supplemented with 40µg of zinc, however, the total weight gain in 8 weeks among the litters of treatment groups and the control was not statistically significant ($P > 0.05$).

Table 1: Effect of zinc supplement on reproduction performance of rabbit does

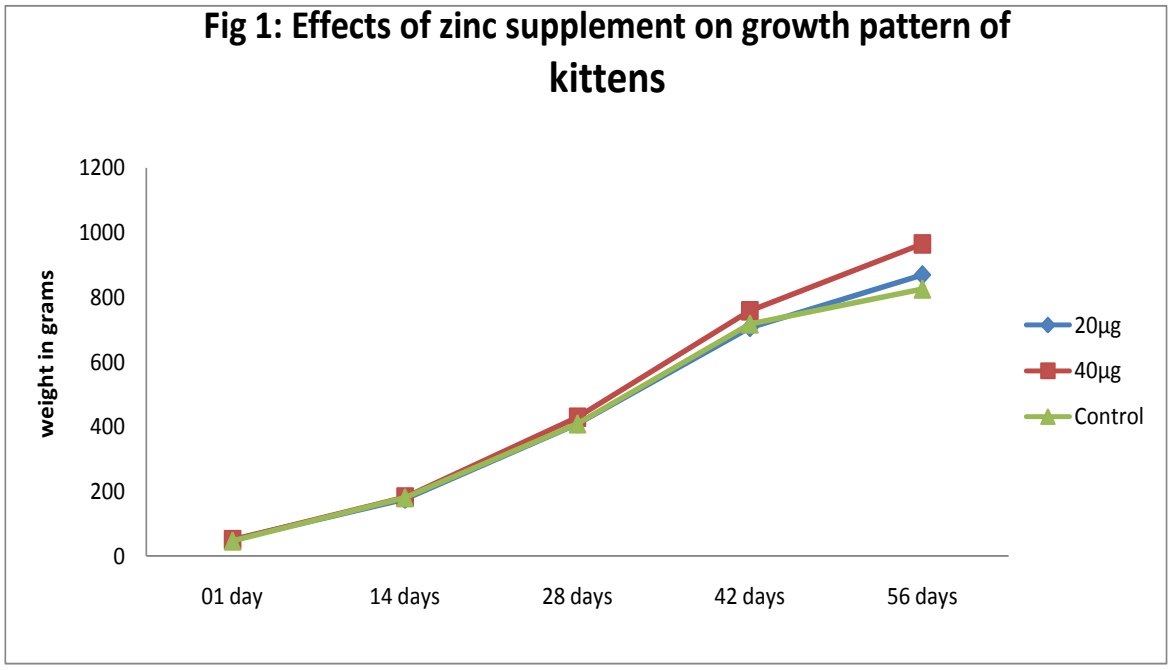
Treatment Groups	Initial weight before conception (kg)	Weight at full gestation (kg)	Weight gain during gestation (kg)	Litter size	Number of kittens weaned	% mortality	Mean birth weight (g)
20 µg	2.46	2.72	0.36	25	15	60.00	50.00
40 µg	2.41	2.75	0.34	22	18	81.87	50.65
Control	2.47	2.77	0.30	07	03	42.86	46.57

❖ All values are mean weight of rabbits ± 0.01 per litter

Table 2: Effect of dietary zinc supplement on growth pattern of kittens

Treatment Group	Birth weight (g)	Weight at 14 days (g)	Weight at 28 days (g)	Weight at 42 days (g)	Weight at 56 days (g)	total weight gain in 8 weeks (g)
20µg	50.65	175.60	408.50	706.58	869.49	818.84
40µg	50.00	181.65	428.75	757.73	964.85	914.85
Control	46.57	180.50	408.75	717.50	872.00	825.43

❖ All values are mean weight of kittens ± 0.01 per litter



DISCUSSION

The study carried out was to determine the effects of dietary zinc supplement on performance of rabbits and growth rate after weaning of kittens, perhaps with the intervention of trace elements such as zinc as dietary supplement, we may improve animal protein production by regulating growth rate in kittens. Exposure to zinc supplement enhanced the performance of does rabbits as shown in table 1 and since there was a significant difference in the litter size of supplemented groups and the control at $P < 0.001$. It is therefore, implied that zinc at the dosage level used in this study regulated the performance of rabbits. It improved the metabolic activities and enhanced litter sizes in the affected rabbits, an observation that is in agreement with the report of Hurley and Swenerton (1966) who in an earlier study observed a reduced litter size in zinc deficient sows. More so, the healthy living among kittens from supplemented does was enhanced thereby improving mortality rate. The mortality was lower in zinc supplemented than control, zinc being a biological modifier could have impacted the kittens, and it is not unlikely that adaptive immunity from mammary gland of the Does were fortified with zinc . The correlation between nutrition and immunity has been reported by several authors (Bonham *et al*., 2002; Troost *et al*., 2003; Turnlund *et al*., 2004).

Though, kindling weight of kittens form all the groups were not significantly different but there was a consistent weight gain and growth pattern of kittens from the supplemented and control does were progressive during breast feeding and after weaning the kittens, which implies that zinc at the dosage used in this study had no effect on the birth weight and growth pattern (Fig.1). This finding is in tandem with the reports of other workers: Grappel and Henning, 1971; Ziegler *et al*., 1992 and Klaus Eder and Manfred, 2000; who in their various reports stated that birth weight of animals (rats, pullets and lambs) are not affected by low zinc treatment. The exponential growth rate was independent of zinc treatment, meanwhile, the total weight gain in 8 weeks was more in weaners whose doe were supplemented with 40µg of zinc, though not statistically significant from the control group ($P > 0.05$). which suggests that zinc transferred from does to kittens through lactation had no effect on the growth rate of the kittens, again, this finding is in tandem with the reports of Longe *et al*. (1990) and Isaac *et al*. (2010), who in their various reports observed that growth rate of many species of animal including rabbits is exponential up to the weaning age, after which it becomes linear function and that, it is a function of the type of feed, age and stage of production.

CONCLUSION

In an attempt to improve animal protein production, zinc supplement could be employed to enhance performance of livestock, lower mortality rate among their offspring and also maintain good litter size thereby increasing the quality and quantity of meat production for local consumers.

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