ASSESSMENT OF SYNERGISTIC EFFECT OF ZINC AND VITAMIN A ON SOME PRODUCTIVE AND PHYSIOLOGICAL INDICES IN RABBITS

By

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B.Sc. Agric. Sc (Animal Production), El-Azhar University, 2003

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ABSTRACT

Ahmed Mohammed Mohammed Abd El-Masoud: Assessment of Synergistic Effect of Zinc and Vitamin A on some productive and physiological Indices in Rabbits, Unpublished M.Sc. Thesis, Department of Poultry production, Faculty of Agriculture, Ain Shams University, 2015.

A trial was conducted to assess the effect of vitamin A and Zn either singly or in combination on the productive performance of growing rabbits. A total number of 135 unsexed Rex Rabbits (5wks old) were allotted randomly into 9 groups in a factorial design. There were 3 vitamin A levels (6000, 10000, 14000 IU/kg diet) and 3 Zn levels (50, 100, 150 mg/kg diet). The experiment lasted for 8 wks. The results showed that body weights and body weight gain of rabbits were increased significantly throughout the experimental period in a linear manner due to supplemental vitamin A and Zn. On the other hand, Zn supplementation at any level did not affect on feed consumption of growing rabbits, while vitamin A tended to reduce it especially with the mid-level (10000 IU/kg). These results were reflected in the feed conversion values, as the worst was recorded for the control group. Moreover, the interaction between Zn and vitamin A was highly significant during the growing period indicating the presence of reciprocal positive synergism of both supplements. There were insignificant improvements were observed in most nutrients digestibility coefficients and nutritive values for rabbits fed diets containing 14000 IU of vitamin A. The same trend was noted with rabbits received diet contained 50 ppm zinc/kg. Dietary Zn levels did significantly affect ($P<0.05$ or 0.01) relative weights of kidneys, kidneys fat and spleen. Rabbits fed diet containing 10000 IU vitamin A gave the highest dressing percentage than those received 6000 and

14000 IU vitamin A diets. Rabbits fed 14000 IU/kg diet have significantly (P>0.05) higher total protein and globulin than those fed 6000 or 10000 IU/kg diet. Albumin (g/dl) was noticed to be higher (P≤0.05) for rabbits fed the control diet contained 50 ppm, while the rabbit groups received diets containing 100 or 150 ppm were recorded the lower values for albumin. Rabbit groups fed diets containing either 100 or 150 ppm zinc had lower (P≤0.01) values of total cholesterol than control group which fed received 50 ppm zinc. Higher level of total lipids was recorded for rabbits group fed diet contained 14000 IU vitamin A as compared to rabbits received 6000 or 10000 IU vitamin A. Rabbits group fed 10000 IU vitamin A diet was recorded the higher cholesterol and the lower triglyceride in the blood plasma. Diet of 150 ppm zinc was achieved the higher value for plasma AST as compared with the other treatment groups. There were highly significant differences in protease, cellulase and xylanase enzymes due to feeding rabbits with different levels of zinc and vitamin A. Economic efficiency (%), relative economic efficiency and performance index were increased with rabbits fed diet contained 150 ppm zinc plus 14000 IU vitamin A, while the lowest previous parameters recorded with rabbits fed control diet contained 50 ppm zinc plus 6000 IU vitamin A.

In an attempt to improve animal protein production, zinc and vitamin A supplement could be employed to enhance performance of livestock, lower mortality rate through growing period and thereby increasing the quality and quantity of meat production for local consumers.

Key Words: Zn, vitamin A, rabbits, growth, digestibility, carcasss, blood and economic evaluation

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LIST OF ABBREVIATIONS

ADG	Average daily gain
ADL	Acid detergent lignin
A/G ratio	Albumin / Glubulin ratio
ALT	Alanin aminotransferases
AST	Aspartate aminotransferases
CP	Crude Protein
CF	Crude Fiber
CH	Clover Hay
cm	Centimeter
DBWG	Daily Body Weight Gain
DCP	Digestible Crude Protein
DE	Digestible Energy
DFC	Daily Feed Consumption
dl	deciliter
DM	Dry Matter
DMI	Dry Matter intake
EDTA	Ethylene Di-Amine Tetra-acetic acid
FC	Feed Consumption
FCR	Feed Conversion Ratio
GE	Gross Energy
IU	International Unit
Kcal	Kilocalorie
Kg	Kilogram
LBW	Live Body Weight
LM	Lean muscles
mg	Milligram
MR	Mortality Rate
NFE	Nitrogen Free Extract
NZW	New Zealand White

OM	Organic Matter
RHD	Rabbit Hemorrhagic Disease
TDN	Total Digestible Nutrients
WOA	Weeks of age

1. INTRODUTION

During the ten last years, the techniques of feeding (manufacture, adapted formulation) and the recommendations for rabbit nutrition have strongly evolved, in order to obtain a better adjustment between feed's composition and needs of the animals, according to their physiological stage. Quite all the information available is related with rabbit growth and we will limit the present study to this type of production.

Cost of feeding is the most significant expensive item in animal production and reaches about 60-70% of the total cost in production of rabbits. To reduce the rabbit production cost, it is necessary to improve the feed efficiency and increase the growth rate. Feed additives such as vitamins and minerals are needed for the body in small amounts. They are important materials that can improve the efficiency of feed utilization, animal performance and enhance immune response. These include water and lipid soluble vitamins and minerals i.e., copper, zinc, iron and etc.

Zinc is an essential trace mineral and required for the metabolic activity of 300 of the body's enzymes, and is considered essential for cell division and the synthesis of DNA and protein. These enzymes are involved with the metabolism of protein, carbohydrate and fat **(Chesters, 1997)**. Thus, the presence of Zn in the proper concentration in the diet of the animals is of immense importance not only for the well-being of the animals but also for optimizing the overall performance of the animals and to enhance their production potential **(MacDonald, 2000).** Zinc requirement for rabbits, indicated in the literature, is 30- 60 mg/kg dry matter of diet, with suggestion of higher levels for breeders **(Mateos and Blas., 1998).**

Allam *et al.* (2005) reported that supplementing zinc by 100 mg zinc/kg diet as zinc sulfate (ZnSo4, inorganic form) and zinc methionine (Zn-Meth, organic form) in rabbit diets gave better body weight gain and feed conversion ratio as compared with rabbits group received un-supplemented diet (control diet). **Ayyat and Marai (2000)** who found that

supplementing rabbit diets with 100, 200 or 300 mg Zn /kg significantly ($p<0.05$) increased live weight gains, but had no effect on feed intake**,** feed conversion ratio or dressing yield of the rabbits compared with the control or those fed 400 mg Zn /kg supplemented diet. **Al-Khalifa (2006)** found that, addition of Zinc to the diet of rabbits led to partly improve weight gain. Zinc supplementation effected on feed intake and improved feed conversion efficiency. In doses of Zinc 100 and 200 ppm decreased mortality rate by 11 and 22%, dressing carcasses percentage improved by 11-12%. Rcently, **Selim *et al.* (2012)** who reported that supplementing Zn by levels of 100 or 200 mg kg diet significantly improved live weight gain and feed conversion ratio compared to the higher level of 400 mg kg diet. Dietary Zn level had no significant effect upon feed intake and dressing percentage.

Another nutrient requirement, for vitamins was recently analysed by **(Lebas 2000).** The vitamin A requirement is largely satisfied if the diet contains 10000 IU vitamin A per kg or 30 ppm of β-carotene. Additional distribution of vitamin A is without interest for the growing rabbits and Vitamin A is involved in the growth and maintenance of all body tissues. Little research has been conducted on vitamin A requirements in rabbits, and so in practice, feeding levels of 6000 IU/kg for fryers and 10000 IU/kg for breeders are recommended **(Lebas *et al.*, 1997; Lane., 1999 and Moreki, 2007)**.

There is much evidence of interaction between zinc and a range of vitamins, particularly vitamin A, vitamin E and folic acid. Zinc is necessary for the synthesis of retinol-binding protein (RBP), which is required for mobilization of hepatic reserves and for the transport of vitamin A in the plasma. Consequently, marginal zinc intake is associated with decreased mobilization of retinol from the liver and also with a lowered concentration of transport proteins in the blood **Boron *et al.* (1988)**.

Vitamin A increased the accumulation and transport of zinc in livestock ileal mucosa and the stimulation of zinc absorption, which may be related to a specific carrier vitamin A dependent zinc binding protein. This protein was