# THE USE OF SOME BIOTECHNOLOGICAL METHODS FOR REDUCING ANTI-NUTRITIONAL FACTORS IN LACTATING ANIMAL RATIONS

By

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B.Sc. Agri. Sc. (Animal Production), Cairo University, 2004

M.Sc. Agri. Sc. (Animal Production), Cairo University, 2009

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# ABSTRACT

**Ahmed Mahmoud Abd El-Tawab Mohamed Eid: The Use of some Biotechnological Methods for Reducing Anti-Nutritional Factors for Lactating Animal Rations. Unpublished Ph.D. Thesis, Animal production Department, Faculty of Agriculture, Ain Shams University, 2013**.

This study was carried out to investigate effects laboratory produced of Tannase enzyme (Tanozym) on diets containing tannins. *A.niger* was grown as stand cultures in 100ml conical flasks containing tannic acid powder medium. The maximum production of Tannase by *A.niger* was achieved at inoculum ratio of 2% (v/v), 96 hrs of incubation period, initial pH 5.0, yeast extract as a nitrogen sources at a concentration of 0.33 g N/l and palm kernel powder (PKP) as a carbon source at a concentration of 25% (w/v)

Two experiments were carried out to evaluate the effects of Tannase supplementation on *in vitro* degradation of tannins and *in vivo* for studying the nutrients digestibility, milk yield and composition by lactating Baladi goats. In the *in vitro* experiment, tannins degradation was determined for PKP supplemented at levels (0, 1.95, 3.9, 5.85 and 7.8U/kg, DM), the maximum removed of total tannins from PKP was achieved at level 5.85 U/kg DM. in the *in vitro* experiment, dry matter and organic matter disappearance (*IVDMD* and *IVOMD*) were determined for control diets (60% CFM and 40% Berseem hay); ($T_1$) control diet containing different levels of polyethylene glycol (PEG), (MW 20000) (10, 15 and 20 g/kg DM) and ($T_2$) control diet with addition different levels from Tanozym (3.9, 5.85 and 7.8 U/kg DM). The maximum *IVDMD* and *IVOMD* values were observed at 5.85 U/kg DM for Tanozym and 20 g/kg DM for PEG compared with control, but there are no significant ($P>0.05$) difference when PEG was added at 15 and 20 g/kg DM compared with Control. In the *in vivo* experiment, nine lactating Baladi goats after 7 days of parturition were divided into three groups, three animals each, using 3x3 Latin square designs. The first group was

fed on control diet (60% CFM and 40% Berseem hay). The second group was fed on $T_1$ (control diet plus 15g/kg, DM). The third group was fed $T_2$ (control diet plus 5.85U/kg, DM). Tanozym supplementation significantly ($P<0.05$) increased nutrients digestibility, nutritive values, ruminal total volatile fatty acids (TVFA's), and insignificant ($P>0.05$) increased of ammonia nitrogen (NH3-N), while lower significantly ($P<0.05$) values of rumen pH treated group compared with the control. Blood serum of animals fed on Tanozym and PEG had higher values of total protein, albumin, globulin, total lipids, urea and glucose and lowest values of AST and ALT compare with control Milk yield was significantly ($P<0.05$) increased for Tanozym and insignificant ($P>0.05$) increased for PEG treated groups compared with the control group. However milk composition did not significantly ($P>0.05$) change for TS%, SNF%, fat%, and ash% and significantly ($P<0.05$) change for protein% and lactose% among all groups. Tanozym was superior over PEG for improving feed digestion and milk production by Baladi goats .

**Keywords**: tannins, tannase enzymes, digestibility, lactating goats, rumen and blood serum parameters**.**

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# INTRODUCTION

It is known that feed contain a variety of nutrients and small amounts of potentially harmful substances such as toxins that have toxic effects. They are normally called anti-nutritional factors (ANFs) by the scientific community as toxins sounds too alarmist. ANFs have an incredible range of biological effects. The reason of presence of ANFs in plants seems to be as a way of storing nutrient or as a means of defending their structure and reproductive elements **(Harborne, 1989)**.

In fact, plants contain thousands of compounds which, depending upon the situations, can have beneficial or deleterious effects on organisms consuming them. Tannins may be regarded as a class of these compounds, which are generally not lethal. They diminish animal productivity but may also cause toxicity during periods of scarcity or confinement when the feed rich in these substances is consumed by animals in large quantities **(Kumar, 1992)**.

In an attempt to overcome some of the problems associated with chemical and biological treatment processes, recent researches were focused on the solving environmental problems through the applications of pure enzymes that have been isolated from their producing organisms **(Murugan and Al-Sohaibani, 2010)**.

Despite the antimicrobial properties of tannins, many microorganisms can grow and develop on tannin rich materials. They not only evolved tannin resistant but also utilizing mechanisms. A number of reviews on tannin biodegradation have appeared in the past, providing a general idea on the biodegradation of these polyphenols **(William *et al.*, 1986 and Bhat *et al.*, 1998)**. It is reported that the hydrolysis of tannins could be brought about with the help of tannase enzyme **(Aguilar and Gutiérrez, 2001)**. These enzymes catalyses the hydrolysis of bonds presents in the molecule of the hydrolysable tannins and gallic acid esters

**(Lekha and Lonsane, 1997)**. It plays an important role in the treatment of tannery effluents **(Iibuchi *et al*., 1968)**.

Tannase can be used in food and beverage industrial products contribute to remove the undesirable effects of tannins. The use of tannase as an ingredient of animal feed would improve the digestibility of the feed **(Lekha and Lonsane, 1997)**. The enzyme has potential used in the treatment of tannery effluents and pre-treatment of tannin containing animal feed **(Aguilar *et al*., 2007 and Murugan and Al-Sohaibani, 2010)**.

The main objective of this study was to determine the effect of using laboratory produced tannase enzyme (tanozym) to reduce negative tannins effect as anti-nutritional factor in lactating Baladi goats diets on digestion coefficient, nutritive values, rumen and blood parameters and milk production and composition.