



The Effect of *Thymus vulgaris* on immune response and growth performance of albino rats

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ABSTRACT

This study was aimed at describing immunological and growth changes in response to *Thymus* administration to albino rats. It was hypothesized that in response to *Thymus* administration to albino rats, they would show sign of immuno-elevation and growth performance. Materials and Methods: The experimental method of pre-post analysis was used. Thirty male albino rats, body weight of 190 ± 10 grams were used in this experiment, they were divided into two groups, control (n = 15), experimental (n = 15) Thyme treated, for 2 months at a dose level of 250 mg/kg b.w. Blood samples were collected in centrifuge tubes for detection of immunoglobulins (IgG, IgA, IgM), SOD, Malondialdehyde, growth hormone together with body weight of the albino rats. Results indicated an elevated SOD and immunoglobulins and a decreased Malondialdehyde after Thyme administration, also growth hormone increased together with body weight of albino rats. In Conclusion: *Thymus* administration showed encouraging improvement on growing albino rats performance and control oxidative stress and imbalances and promote better immune health.

KEYWORDS: *Thymus vulgaris*, Albino rats, immune response, growth performance

INTRODUCTION

Growth means the relative irreversible time changes in the measured dimensions. The dimensions includes the size (length or height) and total body weight. True growth should include increase in weights of different tissues like the muscles, bone as well as internal organs, excess fat deposited in the fat depot in the body occurs in cases of feeding on imbalanced food containing excess carbohydrate, which will be stored in the body as fat [1].

Buttler and Leroith [2] added that there are many factors contribute for normal growth: genetic affect the growth through intrinsic regulators and extrinsic factors, also the plane of nutrition which provide the living organism with the building materials essential for growth, also the protein is an essential factor in the growth of young after birth as example milk supplies the young individual with protein that stimulate growth, also rabbits grow faster than chickens because it depend on milk in early life, sex, also affect growth in two folds, direct due to gene and indirect due to sex hormones, also vitamins and minerals act as cofactors required to utilize the food for growth.

Growth hormone has been believed to be secreted primarily during the period of growth, but then disappeared from the blood at adolescence, this has proved to be untrue. After adolescence, secretion decreases slowly with aging, finally falling to about 25 percent of the adolescent level in very old age [3]. They added that several factors related to the person's state of nutrition or stress are known to stimulate secretion: starvation, hypoglycemia exercise, excitement and trauma, also it has been found that growth hormone causes the liver and

other tissues as muscles to form several small proteins called somatomedins, many of the somatomedin effect on growth are similar to the effects of insulin on growth, they are called insulin like growth factor.

Shaban [4], reported some pharmaco-dynamic studies of *Thymus vulgaris* plant, that *Thymus vulgaris* is used in folk medicine since ancient times and still used in modern era, and it contain many products as alkaloids, carbohydrates and glycosides, resins, saponins, tannins and unsaturated sterols and triterpenes and treatment of rats with extract of *Thymus vulgaris* at dose of 250 and 500 mg/kg b.w. protects the gastric mucosa against damaging effect and the prolonged administration of *Thymus vulgaris* for 2 months improved the body weight.

Osman, [5] reported the effect of thyme and garlic essential oils and their combination on the performance of Japanese Quail, growth digestibility, carcass traits hematological indices, they conclusion of the research indicated that Thyme oil and garlic had showed improvement on growing Japanese Quail performance, increased the antioxidant level and promote immune health. Shetti, [6] reported that adding thyme to wheat flour enhanced the natural antioxidant and nutritive value of treated bread. The treated bread was healthy which lowered the blood lipids and cholesterol. Abdel Fatah, [7] stated that *Thymus* induced antimicrobial activity and posses anti pain action [8], also due to its content of selected vitamins and trace elements which support immune function [9].

Reactive oxygen species (ROS) are capable of reversibly or irreversibly damaging many of the biological molecules including phospholipids, protein and DNA that have impact on cell activities as well as membrane functions and structure and DNA mutations [10]. The generation of ROS has been implicated in the pathogenesis of many diseases include cancer and inflammatory disorder [11]. Halliwell, [12] showed that shift to a more oxidative state might result in uncontrolled lipid peroxidation, protein oxidation and ultimately cell death. For these reasons, the search for novel substances that defense against ROS must be the target of many studies including this study. Several classes of compounds, such as protein, peptide, lipopolysaccharide, glycoproteins, lipid derivatives have been classified as molecules that have potent effects on the immune system [13].

Aim of the study:

This study was aimed at describing immunological and growth changes in response to *Thymus* administration to albino rats.

Hypothesis:

It was hypothesized that in response to *Thymus* administration to albino rats, they would show sign of immuno elevation and growth performance.

MATERIALS AND METHODS

The experimental animals used throughout the work were healthy male adult albino rats Sprague – Dawley strain weighing 190 ± 10 g, it was supplied by the breeding unit of the Egyptian organization for Biological products and vaccines (Helwan, Egypt).

Animal trial :

Total number of healthy thirty albino rats were started for experimentation in animal biological room related to physiology department, Fac. of Veterinary Medicine, Zagazig Univ., where all rats were randomly housed individually in stainless steel cages with constant controlled environments: Temperature $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$, and 12/12 hrs light/dark cycle were held, all rats were offered balanced diet with drinking water adlibitum. Before the experimental period all rats were held for 7 days as adaptation period and throughout the experiment, the rats were divided into two groups each was composed of 15 rats, the control and experimental groups, the experimental group administered a single oral daily dose thyme extract for two months at a dose level of 250 mg/kg bw [4].

Tools and devices used:

- Syringes.
- Test tubes with covers.
- Digital balance weight (satorus).
- Coleman, ices, Deep freezer.
- Kits for SOD, MDA, growth hormone.
- ELISA technique and spectrophotometer.
- Radial plates for immunoglobulins (IgG, IgA, IgM).

Measuring loop for reading:

The recommended dose for *Thymus vulgaris* 250 mg/kg b.w. daily for two months. *Thymus vulgaris* contain minerals and vitamins, vitamins B Complex, Vit A, Vit C, Vit K.

Minerals:

Potassium, Iron, Magnesium, Calcium, Manganese, Selenium.

Also volatile oils like thymol. Antioxidants, flavenoids including leuteoline, Nariginine, Thioumounin.

Statistical Analysis:

The data were analyzed using the statistical package for social science (SPSS) were characterized by their mean and standard deviations. Student "t" test was used for statistical analysis of the results and values at 0.05 level is considered statistically significant [14].

Results:

Table (1): Basic SOD, Malondialdehyde, immunoglobulins in control and experimental groups of albino rats indicated non significant changes of the parameters.

Table (2): Basic growth hormone, body weight in control and experimental albino rats revealed non significant changes of the parameters.

Table (3): The effect of thyme administration on SOD, MDA, Immunoglobulins revealed a significant increase of SOD, immunoglobulins and decreased MDA concentrations.

Table (4): The effect of Thyme administration on growth hormone, body weight of albino rats revealed a significant increase in both variables.

Table 1: Basic SOD, Malondialdehyde, immunoglobulins concentrations in control and experimental groups.

Group	SOD μ/ml	Malondialdehyde Mmol/ml	Immunoglobulin		
			IgG	IgM	IgA
Control	121±10.1	63.2±1.7	0.20±0.1	0.37±0.2	0.04±0.01
Experimental	122±11.3	64.1±1.3	0.21±0.2	0.35±0.1	0.05±0.1

Non significant level P < 0.05

Table 2: Basic growth hormone, body weight in control and experimental groups.

Group	Growth hormone Pg/ml	Body weight/g
Control	3.5 ± 0.8	190 ± 18.1
Experimental	3.8 ± 0.9	1.91 ± 19.2

Non significant level P < 0.05

Table 3: Effect of administration of thyme on superoxide dismutase, malondialdehyde and immunoglobulin concentrations.

Group	SOD μ/ml	Malondialdehyde Mmol/ml	Immunoglobulin		
			IgG	IgM	IgA
Control	124.5±11.3	65.8±1.6	0.19 ± 0.1	0.36±0.2	0.04±0.01
Thyme group	212.3±22.1	41.3±1.8	0.41 ± 0.2	0.45±0.03	0.16±0.1

Significant level P < 0.05

Table 4: Effect of administration of Thyme on growth hormone and body weight.

Group	Growth hormone Pg/ml	Body weight/g
Control	3.6 ± 0.7	238 ± 17.3
Experimental	5.9 ± 0.9	250 ± 21.4

Significant level P < 0.05

Discussion:

Superoxide anions are produced at any location where an electron transport chain is present, and hence O₂ activation may occur in different compartments of the cell [15]. Therefore it is not surprising to find SOD's in all these subcellular locations including the plant roots which are used to scavenge these radical species [16].

Table (3) indicated that *Thymus* administration increased SOD activity and suppress Malondialdehyde, thus suppress the activity of the free radicals (O₂⁻, OH and H₂O₂) produced. This was in accordance to Habib et al. [10]. Mohamed et al. [17], Packer [18]. In the present study, *Thymus* showed SOD activity, this enzyme uses O₂ as a substrate converting it into H₂O₂, which can be used by other antioxidants like catalase and glutathione peroxidase. This indicated the protective effect of the *Thymus*. Table (3) revealed an increased antibodies product IgG, IgA, IgM in response to *Thymus* administration. This result confirm the ability of the *Thymus* administration to stimulate B-cells to produce specific antibodies. Since the specific immunity to cells includes generation of antibodies, promotion of inflammatory responses leading to kill the pathogens [19]. Alscher et al. [16] reported the role of superoxide dismutase in controlling oxidative stress in plants, and in related areas in molecular biology [20]. Also Al Zahraa et al. [21] stated that *Thymus* may improve natural antioxidant activity

and the treated bread with *Thymus* lower lipids and cholesterol and improve health, The data of this research was in accordance with those of Alshaimaa [22], Hassan [23], Hasnaa [24], Trinchieri [25] and Udintsev et al. [26]

Data presented in table (3) indicated an increased body weight of albino rat after *Thymus* administration together with an elevation of growth hormone registered. This result is in accordance with that of Osman, (5); Hasnaa, [24]; Hassan, [27].

Guyton and Hill, [3] stated that all the major anterior pituitary hormones, except for growth hormone, exert their principal effects by stimulating target glands. Growth hormone, in contrast to other hormones, does not function through a target gland but exerts its effects directly on all or almost all tissues of the body. They added that in comparison of a rat gain injected daily with growth hormone with that of a normal littermate. In the early stages of development, all organs of the treated rats increase in size, after adulthood was reached, most of the bones stopped lengthening, but many of the soft tissues continue to grow.

Cunningham [28] and Ganong [29] stated that growth hormone perform its effects on target tissues through liberation of somatomedin C also called IGF₁ and IGF₂. These polypeptides are secreted from liver and trivial amounts from other tissues like muscles. He added that vitamins and minerals like vit. B₁, complex, B₁₂, vit. E, C, A, together with calcium, phosphorus selenium, magnesium and manganese, iron, copper, cobalt, zinc, molybdenum all these minerals and trace are very essential to growth, which are constituents of the *Thymus vulgaris* which denote the important role by this plant in promoting growth of the albino rats of this study.

The increased growth remarked after *Thymus* administration may be due to the antioxidant action of *Thymus* together to its content of vitamins and minerals all of which help in increasing growth and body weight reported in this study, which indicate that *Thymus* administration increased growth hormone and growth hormone in turn enhances almost all facets of amino acid uptake and protein synthesis by cells, while at the same time reducing the breakdown of protein inducing increase in body weight [30; 31, 32; 33; 34].

In conclusion, the results showed that *Thymus* had showed encouraging improvement on growing albino rats performance. Using *Thymus* as feed additive increased the antioxidant level which can help to control oxidative stress and imbalances and promote better immune health. This means that *Thymus* would be safe for the rats to consume, which in turn helping the lab animal to exhibit better health and growth, due to *Thymus* content of different vitamins, minerals and oil like thymol, antioxidants, flafanoid compound. From the previous discussion. The hypophesis, that in response to *Thymus* administration to albino rats, they would show sign of immuno elevation and growth performance. The hypophesis has been realized.

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