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EFFECT OF PYROSOL SPRAYS WITH AND WITHOUT TAURINE ON GROWTH AND SOME PHYSIOLOGICAL BODY FUNCTIONS OF RABBITS REARED UNDER DIFFERENT CLIMATIC CONDITIONS

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ABSTRACT

Eighty New Zealand White rabbit's bucks after weaning were used in the present research through two experimental periods. The first was carried out during winter season for12 weeks on 40 animals where the ambient temperature (AT) and relative humidity (RH%) values were 21.39±0.49^{o}C and 64.65±0.59 %, respectively, The second was carried out during summer season for 12 weeks on another 40 animals where the AT and RH% values were 35.31±0.31^{o}C and 53.78±0.67%, respectively. Under each of season experiment, rabbits divided to 4 equal groups, 10 rabbits in each. The 1stgroup served as control without any treatment. The 2ndgroup exposed to spraying pyrosol between rabbitries two times daily. The 3rd group supplemented with taurine in drinking water at the rate of 1 gm/liter. The 4th group exposed to pyrosol with adding taurine.

Results showed that significant decrease in BWG, DMI and FE and significant increase in daily WI in rabbits of four experimental groups exposed to hot summer season as compared to winter season. Pyrosol sprays caused significant decrease in BWG, DMI and daily WI of rabbits. Adding taurine increased significantly BWG, DMI and daily WI. Adding taurine with exposed to Pyrosol sprays alleviate the side effect of pesticide on feed and gain of rabbits. Serum glucose level in rabbits decreased significantly while serum total cholesterol, LDL and HDL concentrations increased significantly due to exposed the rabbits to summer season as compared to winter season. Pyrosol sprays caused significant increases in glucose, total cholesterol, LDL and HDL concentrations. Adding taurine decreased significantly glucose, total cholesterol and HDL concentrations and increased significantly HDL. Adding taurine plus exposed to pyrosol sprays caused recovering the decrease in glucose level to reach the same level in control group.

Heat stress of summer season increased significantly serum cortisol level and decreased significantly serum ATP-ase and Chol.-E-ase enzymes activities as well as glutathione concentration in rabbits. Pyrosol sprays caused significant increases in cortisol concentration and significant decreases in each of ATP-ase, Chol.-E-ase enzymes activities and glutathione concentration. Adding taurine decreased significantly cortisol level and increased significantly ATP-ase, Chol.-E-ase and glutathione concentrations. Adding taurine with exposed to Pyrosol sprays alleviate the side effect of pesticide on serum cortisol hormone and some oxidative enzymes activities. Serum ALT and AST enzymes activities and urea-N and creatinine concentrations increased significantly due to exposed rabbits to summer of Egypt. Pyrosol sprays affect negatively liver and kidney functions. Adding taurine with exposed to Pyrosol alleviate the negative effect of pesticide on liver and kidney functions. Heat stress of summer season decreased significantly serum trace elements concentrations in rabbits. Pyrosol sprays caused significant increases in Pb and Cd concentrations. Mortality rate increased from 10% during winter season to 27.5% during summer season. Pyrosol sprays caused significant increases in mortality

rate from 10% in control group to 35% with sprays of pyrosol and decreased to 20% in group exposed to pyrosol with taurine.

KEYWORDS: Blood Components, Growth, Hormones, Oxidative Stress, Pyrosol, Rabbits, Taurine

INTRODUCTION

Insecticides are agents of chemical or biological origin that control insects and that control may result from killing the insect or otherwise preventing it from engaging in behaviors deemed destructive. Insecticides may be natural or manmade and are formulated to kill, harm, repel or mitigate one or more species of insect (Palmer et al., 2007). Pesticide products include both active ingredients and other ingredients. Active ingredients are the chemicals in pesticide products that kill, control, or repel pests and the toxicity depends on the ingredient(s). Often, the active ingredients make up a small portion of the whole product. Other ingredients may do a variety of jobs, like attracting the pest, spreading the active ingredients around and/or reducing drift. Insecticides can be packaged in various forms including sprays, dusts, gels, baits slow-release diffusion. Because of these factors, each insecticide can pose a different level of risk to non-target insects, people, pets, animal and the environment (Department of Pesticide Regulation, 2008).

The effects of pesticides on human and animals health are more harmful based on the toxicity of the chemical and the length and magnitude of exposure. Exposure to pesticides can range from mild skin irritation to birth defects, tumors, genetic changes, blood and nerve disorders, endocrine disruption, leukemia and even coma or death (Lorenz, 2009). Pesticides may be absorbed through dermal contact, ingestion, and inhalation and the chemicals of pesticides can bioaccumulate in the body over time (Department of Pesticide Regulation, 2008). Pesticides can enter the human body through inhalation of aerosols, dust and vapor that contain pesticides; through oral exposure by consuming food and water and through dermal exposure by direct contact of pesticides with skin. Pesticides are sprayed on to food, especially fruits and vegetables, they secrete into soils and groundwater which can end up in drinking water and pesticide spray can drift and pollute the air (Department of Pesticide Regulation, 2008). Animals may be poisoned by pesticide residues that remain on food after spraying and some pesticides can bioaccumulate to toxic levels in the bodies of organisms that consume by birds and small animals (Shahla and Doris, 2010).

Taurine is the major amino acid required by the liver for the removal of toxic chemicals and metabolites from the body. Recent findings are demonstrating that taurine is one of the major nutrients involved in the body's detoxification of harmful substances and drugs and should be considered in the treatment of all chemically sensitive patients (European Food Safety Authority, EFSA, 2012). Taurine has many fundamental biological roles such as conjugation of bile acids, antioxidation, osmoregulation, membrane stabilization and modulation of calcium signaling. Taurine plays also a role in stabilizing transport across cell membranes and provides antioxidant protection and stabilizes the electrical properties of cell membranes (Redmond et al., 1998). Taurine is required for the healthy production of bile (detoxification) and the liver uses it to conjugate chemical toxins, drugs and metabolites in the liver via the acylation route to excrete through the bile and also through water-soluble acetates in the urine and help the liver to excrete excessive cholesterol out of the body through the bile (Huxtable, 1992 and Chauncey, 2000). Taurine also acts as an antioxidant and protects against toxicity of various substances such as lead and cadmium (Gürer et al., 2001 and. Sinha et al., 2008). Additionally, supplementation with taurine has been shown to prevent oxidative stress induced by exercise or severe heat stress conditions (Zhang et al., 2004a). Moreover, Association of American Feed Control Officials (AAFCO, 2003) decided that

taurine is now a requirement of the Association of American Feed Control Officials and any dry or wet food product labeled approved by the AAFCO should have a minimum of 0.1% taurine in dry food and 0.2% in wet food.

Scientific opinion on the safety and efficacy of taurine as an additive to feed and water for drinking for all animal species, EFSA (2012) concluded that up to 0.2 % taurine in feed is tolerated by all animal species. In the case of poultry and ruminants, no studies demonstrating beneficial effects of taurine supplementation on performance, health or product quality have been found. In laying hens, dietary supplementation with 0.25–0.5 % taurine has been shown to have an adverse effect (reduced egg weight) (Thorstensen et al., 2012). Taurine is included in the European Union Register of Feed Additives pursuant to Regulation (EC) No 1831/2003. It is authorized without a time limit in application of Article 9t (b) of Council Directive 70/524/EEC concerning additives in feeding stuffs (2004/C 50/01) for use in all animal species as a nutritional additive (EFSA, 2012). The present study was designed to investigate whether taurine in drinking water at the rate of 1 gm/liter has a beneficial effect growth performance and physiological body functions, especially, during hot summer season on rabbits following Pyrosol sprays exposure between rabbitries two times daily. Therefore, body weight gain feed intake, water intake and some physiological body functions in rabbits of Pyrosol exposed were determined with and without taurine treatment.

MATERIALS AND METHODS

The practical work and the biochemical analysis were carried out in Biological Applications Department, Radioisotopes Application Division, Nuclear Research Centre, Atomic Energy Authority, Inshas, Cairo, Egypt.

Experimental Procedure

Eighty New Zealand White (NZW) rabbit's bucks after weaning and sexuality were used in the present research through two experimental periods. The first was carried out during winter season (January, February and March) for 12 weeks on 40 rabbit's bucks after weaning and sexuality with initial average live body weight (LBW) of 500±10g where the ambient temperature (AT) and relative humidity (RH%) values were 21.39±0.49^{o}C and 64.65±0.59 %, respectively, The second was carried out during summer season (June, July and August) for 12 weeks on another 40 rabbit's bucks after weaning and sexuality with initial average LBW of 490±15g where the AT and RH% values were 35.31± 0.31^{o}C and 53.78±0.67%, respectively. Under each of season experiment, rabbits divided to 4 equal groups, 10 rabbits in each with nearly similar initial average live body weight. The 1st group served as control without any treatment. The 2nd group exposed to pyrosol treatment by spraying pyrosol (El-Nasr CO. for Intermediate Chemicals) between rabbitries two times daily at 10.00 and 14.00 hr. The 3rd group supplemented with taurine in drinking water at the rate of 1 gm/liter (Food group, from Sigma Chemical Co., St. Louis Mo., USA.). The 4th group exposed to pyrosol treatment like the second group and supplemented with taurine like the fourth group.

Animal Housing and Management

The experimental groups of rabbits were housed in a part of the Rabbitary building during each of winter and summer experiment. The Rabbitry building was naturally ventilated through wired windows and provided with automatic controlled sided exhaustion fans. The animals were housed in galvanized wired and the galvanized wire cage batteries were arranged in rows back to back. Urine and faces dropped from cages on the floor were cleaned daily. The experimental groups of rabbits were kept under the same managerial and hygienic conditions and fed the same diet in each of winter and summer period. The ingredients of the commercial pelted diet are 42.50% clover hay, 24.0% wheat bran,

15.0% yellow corn, 10% Soybean meal (44% CP), 5% molasses, 1.75% bone meal, 0.70% calcium carbonate, 0.55% sodium chloride, 0.35% Vitamins and minerals premix and 0.15% DL-Methionine. The chemical analysis are 18.00% crude protein., 2.8% ether extract, 12.0% crude fiber and 2600 kcal DE/kg diet according to **A.O.A.C. (1997).** Each kilogram of vitamin and minerals premix contained: 10.000 IU Vit. A, 900 IU Vit. D3, 2 mg Vit. K, 50 mg Vit. E, 2mg Vit. B_1, 6 mg Vit. B_2, 2 mg Vit. B_6, 0.01 mg Vit. B_{12}, 20 mg panathonic acid, 50 mg niacin, 5 mg folic acid, 1.2 mg biotin, 12000 mg choline, 3 mg copper, 0.2 mg iodine, 75 mg iron, 30 mg manganese, 70 mg zinc, 0.1 mg selenium, 0.1 mg cobalt and 0.04 mg magnesium (Pfizer-Co., Egypt).

Meteorological Data and Temperature Humidity Index (THI) Estimation

Weekly air temperature(AT) (^oC) and relative humidity (RH%) inside the rabbitary building were measured four times at 12.00, 13.00, 14.00 and 15.00 hours using automatic thermo-hygrometer and averaged monthly. The averages of AT and RH% were 21.39 ± 0.49 ^oC and 64.65±0.59% during winter (January, February and March) and were 35.31 ± 0.31^oC and 53.78±0.67% during summer experiment (June, July and August) respectively**.** Each value from air temperature and relative humidity was the average of four weeks recorded monthly at different interval hours of the day during the two experiments.

The temperature-humidity index (THI) was calculated using the equation as follows: THI=db^oC–[(0.31-0.31RH) (db^oC-14.4)] where db^oC=dry bulb temperature in Celsius and RH= relative humidity percentage /100 according to Livestock and Poultry Heat Stress Indices (1990). The THI values obtained were then classified as follow: <27.8= absence of heat stress, 27.8 to < 28.9= moderate heat stress, 28.9 to <30.0 = severe heat stress and 30.0 and more = very severe heat stress (Livestock and Poultry Heat Stress Indices, 1990). The estimated THI values were 19.04 during the mild climate of winter and 30.54 in the hot climate of summer season, indicating absence of heat stress in the first period and exposure of rabbits to severe and very severe heat stress in the second one.

Growth, Feed and Water Intake

Live body weight (LBW) of each buck was weighed biweekly interval using digital balance to the nearest gram. Feed and water intake values were estimated biweekly interval in four experimental groups during the two experimental periods. Food consumption was measured by subtracting the residuals of feed from that offered for each buck. Feed efficiency was calculated by dividing body gain by feed intake (g gain/g feed). Water intake was estimated by measuring the difference in the water volume in the crocks. Mortality was estimated in four experimental animals during the two experimental periods as following: Initial number-final number×100/initial number.

Blood Sampling and Blood Analysis

At the end each experimental period, one blood sample from each buck was withdrawn from marginal ear vein in vacationer tubes without anticoagulant and centrifuged for 20 minutes at 2000 x g to obtain serum. Serum was kept in a refrigerator (-20) until blood serum components, enzymes, hormone and trace elements levels were estimated. Glucose, total cholesterol, LDL cholesterol were determined using chemical reagent kits. HDL cholesterol was estimated by subtracting LDL cholesterol from total cholesterol. Adenosine triphosphatase (ATP-ase), Cholinesterase (Ch.E-ase) and Glutathione enzymes activities in serum of rabbits were assayed using chemical reagent Kits (SIGMA-ALDRICH, Inc. St. Louis, MO., USA. Calculate sensitive ATP-ase activity from the amount of generated inorganic phosphate as follows, sensitive ATP-ase activity (nmol Pi/min/mg protein) = [generated inorganic phosphate (nmol)]÷[reaction time (min)] ÷

[protein amount (mg)] according to Webb (1992). After deproteinization of serum by 10% trichloroacetic acid in supernatants, the level of glutathione reductase (GSH) in serum was determined by the Ellman method (Ellman, 1959) and modified by Teitze (1969).

The substrates used were purchased from Sigma. GSH activity was determined spectrophotometrically after the oxidation of NADPH at the wavelength 340 nm in the presence of excess glutathione oxidative (GSSG) and enzyme activity was expressed in milliunits mM/ml of serum according to Carlberg and Mannervik (1985). Cholinesterase activity in rabbit's serum was determined using reagent kit purchased from Quimica Clinica Aplicada, Spain. Cholinesterase activity was determined in serum by the colorimetric method of Ellman et al (1961) which is based on the reaction between thiocholine, which is one of the products of the enzymatic hydrolysis of the synthetic substrate (acetylthiocholineiodide) with the sulfhydryl group of 5, 5′-dithiobis-2-nitrobenzoic acid.

The formation of the yellow product of this reaction (5-thio-2-nitrobenzoic acid) is measured by monitoring absorbance at 410 nm using an UV spectrophotometer. The level of cortisol in serum was estimated by the radioimmunoassay (RIA) technique using the coated tubes kits, Diagnostic Systems Laboratories, Inc. Webster, Texas, USA and counting in the Laboratory of Biological Applications Department, Atomic Energy Authority, using computerizes Gamma Counter. The tracer in the hormone was labelled with iodine-125 (^{125}I). Lead (Pb), cadmium (Cd), Zinc (Zn) and selenium (Se) concentrations in serum were analyzed after deproteinization by a single dilution micromethods using Perkin-Elmer Crop, model 290B Atomic Absorption Spectrophotometer, Norwalk, C.T.

Statistical Analysis

The data were statistically analyzed using computer system according to **SAS (2004)** by ANOVA (4 x 2). The percentage change due to heat stress was calculated as follows: {(mild ± hot) x 100}/mild. The percentage change due to treatment was calculated as follows: {(control ± treated) x 100}/control.

RESULTS AND DISCUSSIONS

Body Weight Gain, Dry Matter Intake, Feed Efficiency and Water Intake

Table 1 shows the effects of Pyrosol sprays with and without Taurine on daily body weight gain (BWG), dry matter intake (DMI), feed efficiency (FE) and water intake (WI) in rabbits during winter and summer seasons. Concerning the effect of season, data showed that significant decrease in each of BWG, DMI and FE and significant increase in daily WI in rabbits of four experimental groups due to hot summer season as compared to winter season. Concerning the effect of pyrosol, Table (2) showed that sprays of pyrosol between battaries of rabbits caused significant decrease in BWG, DMI and daily WI of rabbits by 24.8, 27.2 and 10.3%, as compared to control group, respectively, regardless season of the year. The decrease percentage in BWG was nearly to the decrease percentage in DMI, therefore no significant change in FE due to pyrosol treatment. Adding taurine in drinking water of rabbits increased significantly BWG by 8.0%, DMI by 11.1% and daily WI by 7.7% as compared to control group. No significant change in FE due to adding taurine because the percentages increase in BWG and DMI were nearly the same values Table 1.

Adding taurine in drinking water of rabbits with exposed to pyrosol sprays between battaries alleviate the side effect of pesticide on feed and gain of rabbits. pyrosol without taurine caused 24.8% decrease in BWG while with taurine the percentage decrease reach to 8.0% only. In addition, DMI decreased by 27.2% due to treated rabbits with pyrosol while when adding taurine in drinking water, this decrease in DMI was recovered. The same recovering was observed in daily

WI, since daily WI with adding taurine in drinking water of rabbits exposed to pyrosol sprays became normal like control group. In comparison between winter and summer, Habeeb et al. (1993) found that DG and FI of Californian rabbits decreased significantly by 25.2 and 21.0%, respectively, as a result to exposed rabbits to hot summer season in Egypt. Marai et al. (1994) reported that DG of rabbits decreased significantly from 27.4 and 21.3 g under winter condition to 19.1 and 16.5 g under hot summer condition in NZW and Cal. Rabbits, respectively. The same trend was recorded in weekly FI of NZW and Cal. Rabbits. Similarly, Habbeb et al. (1997 and 2010) found a significant decrease in DG and FI due to exposed rabbits to hot summer season. Marai et al. (2008) studied the growth performance and physiological response of NZW and Cal. rabbits under hot summer conditions of Egypt and reached to similar results. Thermal effect with heat stress is probably, the most important factor and is widely recognized as one of the leading causes on the performance of animals.

It affects their dry matter intake, feed efficiency and growth including disruption their homeostasis and metabolism. Rabbits in Egypt suffer from heat stress during the long hot humid climate in summer (May to November). A temperature of 13-20°C is known as the comfort zone for rabbits. In hot climate months, rabbits are very susceptible to heat stress, since they have un-functional sweat glands and have difficult in eliminating body heat when the environmental temperature is high (Marai and Habeeb, 1994). Alleviation of heat-stress can be carried out with growth promoters, minerals, amino acids or vitamins supplementation and housing design (Habeeb et al., 2010). Productivity and reproductive performance of rabbits are impaired as a result of the drastic changes in biological functions caused by heat stress (Habeeb et al. 1993 Habeeb et al., 1999). At higher temperature (30°C), the appetite depressed, the productive and reproductive performances are impaired and the resistance to disease is decreased. Rabbits above 35°C, can no larger regulate their internal temperature and heat prostration sets in (Marai et al., 2002 and Marai et al., 2008).

Table 1: Effect of Pyrosol Sprays with and without Taurine on Body Weight Gain (BWG), Dry Matter Intake (DMI), Feed Efficiency (FE) and Water Intake (WI) in Rabbits during Winter and Summer Seasons

Growth Parameters	Climatic Conditions	Without Treatment	Treated with Pyrosol (P)	Treated with Taurine, TR	Treated with P +TR
BWG (g/day)	Winter	28.5 ± 0.6	22.5 ± 0.4	30.5 ± 0.4	26.5 ± 0.8
	Summer	21.5 ± 0.5	15.0 ± 0.7	23.5 ± 0.5	19.5 ± 0.6
	Overall	25.0^{b} ± 0.8	18.8^{d} ± 0.9	27.0^{a} ± 0.7	23.0^{c} ± 0.8
	Change % due to season	-24.6 (P<0.001)	-33.3 (P<0.001)	-23.0 (P<0.001)	-26.4 (P<0.001)
	Change % due to treatment		-24.8 (P<0.01)	+8.0 (P<0.05)	-8.0 (P<0.05)
DMI (g/day)	Winter	140.5 ± 3.5	110.0 ± 4.9	150.5 ± 4.7	130.5 ± 3.9
	Summer	120.5 ± 4.8	80.0 ± 3.4	139.5 ± 2.6	115.5 ± 4.5
	Overall	130.5^{b} ± 5.9	95.0^{c} ± 5.7	145.0^{a} ± 5.9	123.0^{b} ± 4.8
	Change % due to season	-14.2 (P<0.01)	-27.3 (P<0.01)	-7.3 (P<0.05)	-11.5 (P<0.01)
	Change % due to treatment		-27.2 (P<0.01)	+11.1 (P<0.05)	-5.75 (P>0.05)
FE($\times 10^{-2}$) (gain/feed)	Winter	20.3± 0.5	20.4±0.5	20.3±0.4	20.3±0.3
	Summer	17.8± 0.4	18.8±0.6	16.8±0.3	16.9±0.4
	Overall	19.2±0.6	19.8±0.7	18.6±0.3	18.7±0.5
	Change % due to season	-12.3 (P<0.05)	-7.8 (P<0.05)	-17.2 (P<0.05)	-16.7 (P<0.05)
	Change % due to treatment		+3.1 (P>0.05)	-3.1 (P>0.05)	-2.6 (P>0.05)

Table 1: Contd.,

WI (ml/day)	Winter	170 ± 7	145±8	185 ± 10	165 ± 8
	Summer	220 ± 9	205±9	235 ± 11	230 ± 6
	Overall	195^{b} ± 10	175^{c} ± 9	210^{a} ± 10	197.5^{b} ± 8
	Change % due to season	+29.4 (P<0.01)	+41.4 (P<0.01)	+27.0 (P<0.01)	+39.4 (P<0.01)
	Change % due to treatment		-10.3 (P<0.05)	+7.7 (P<0.05)	+1.3 (P>0.05)

Values in the table are LSM ± SE,a, b, c, d LSM with different letters in the same row significantly different at P<0.05.

Serum Glucose and Cholesterol Fractions

Concerning the effect of season, Table (2) showed that serum glucose level in rabbits decreased significantly while serum total cholesterol, LDL and HDL concentrations increased significantly due to exposed the rabbits to summer season in four experimental groups as compared to winter season. Regardless the effect of season of the year, Pyrosol sprays between battaries of rabbits caused significant increases in glucose, total cholesterol, LDL and HDL concentrations by 26.1, 14.5, 16.7 and 12.0%, respectively, as compared to control group.

Adding taurine in drinking water of rabbits decreased significantly glucose, total cholesterol and HDL concentrations by 10.5, 10.0 and 26.7%, respectively, and increased significantly HDL by 10.0% as compared to control group. Adding taurine in drinking water of rabbits plus exposed to Pyrosol sprays between battaries caused recovering the decrease in glucose level due to the effect of Pyrosol sprays to reach the same level in control group.

The increase in total cholesterol, LDL and HDL concentrations (14.5, 16.7 and 12.0, respectively) due to pyrosol sprays between battaries of rabbits was disappeared by adding taurine in drinking water of rabbits.

Table 2: Effect of Pyrosol Sprays with and without Taurine on Serum Glucose and Cholesterol Fractions in Rabbits during Winter and Summer Seasons

Blood Components	Climatic Conditions	Without Treatment	Treated with Pyrosol (P)	Treated with Taurine, TR	Treated with P + TR
Glucose (mg/dl)	Winter	69.6 ±1.1	89.6 ±1.3	62.0 ±1.2	72.7 ±1.4
	Summer	59.7 ±1.2	73.5 ±1.4	53.7 ±1.6	63.6 ±1.5
	Overall	64.7^{b}±2.6	81.6^{a} ±2.4	57.9^{c}±2.5	68.2^{b}±2.6
	Change % due to season	-14.2 (P<0.05)	-18.0 (P<0.05)	-13.4 (P<0.05)	-12.5 (P<0.05)
	Change % due to treatment		+26.1 (P<0.01)	-10.5 (P<0.05)	+5.4 (P>0.05)
Total cholesterol (mg/dl)	Winter	100 ±2.6	120 ±3.1	91±3.6	103 ±4.6
	Summer	120 ±3.4	132 ±2.7	107±4.6	119 ±3.6
	Overall	110^{b} ±4.8	126^{a}±3.6	99^{c}±5.6	111^{b} ±6.6
	Change % due to season	+20.0 (P<0.05)	+10.0 (P<0.05)	+17.6 (P<0.05)	+15.5 (P<0.05)
	Change % due to treatment		+14.5 (P<0.05)	-10.0 (P<0.05)	-0.9 (P>0.05)
LDL cholesterol (mg/dl)	Winter	55±1.6	67±1.2	41±1.6	55±1.2
	Summer	65±1.4	73±1.2	47±1.6	64±1.2
	Overall	60.0^{b}±2.8	70.0^{a}±2.4	44.0^{c}±2.2	59.5^{b}±2.2
	Change % due to season	+18.2 (P<0.05)	+9.0 (P<0.05)	+14.6 (P<0.05)	+16.4 (P<0.05)
	Change % due to treatment		+16.7 (P<0.05)	-26.7 (P<0.01)	--- (P>0.05)

Table 2: Contd.,

HDL cholesterol (mg/dl)	Winter	45±1.2	53±1.2	50±1.6	48±1.2
	Summer	55±1.1	59±1.2	60±1.2	55±1.2
	Overall	50.0^{b}±1.4	56.0^{a}±2.5	55.0^{a}±1.8	51.5^{b}±2.4
	Change % due to season	+22.2 (P<0.01)	+11.3 (P<0.05)	+20.0 (P<0.01)	+14.6 (P<0.05)
	Change % due to treatment		+12.0 (P<0.05)	+10.0 (P<0.05)	+3.0 (P>0.05)

Values in the table are LSM ± SE, a, b, c, d LSM with different letters in the same row significantly different at P<0.05.

Habbeb et al. (1997) reported that glucose level in NZW rabbits decreased significantly from 242 mg/dl during winter to 178 mg/dl during hot summer season. Concerning the effect of taurine on serum glucose, Zhang et al. (1999) reported that taurine is a potent hypoglycemic agent and confirmed that taurine capable of enhancing the effect of insulin. Nakaya et al. (2000) found that taurine also inhibited hyperglycemia and insulin resistance, therefore taurine significantly decreased blood sugar in animals. Study of Winiarska et al. (2009) demonstrated that taurine administration to diabetic rabbits resulted in 30% decrease in serum glucose levels.

Nishimuraa et al. (2009) reported that taurine has been investigated in animal studies as an alternative to glucose as osmotic agent for use in peritoneal dialysis solutions. Dietary intake of taurine leads to the lowering of blood cholesterol levels. Benefit of taurine adding not only taurine is a potent antioxidant but it has been shown to affect some of the body physiological factors specifically, lower blood cholesterol levels. taurine also reducing LDL with total cholesterol and increasing HDL cholesterol in rabbits. Concerning the effect of taurine on serum cholesterol and its fraction, Park and Lee (1998) reported that serum total cholesterol, LDL cholesterol, triglyceride, and hepatic cholesterol, triglyceride, and free fatty acid were effectively decreased by taurine in animals fed a normal diet. Zhang et al. (2004b) demonstrated that the hypocholesterolemic (blood cholesterol-lowering) effect of dietary taurine and reported that taurine is a key ingredient of bile, which in turn is needed for fat digestion, absorption of fat-soluble vitamins as well as the control of cholesterol serum levels in the body. Yany et al. (2002) indicated that LDL (bad cholesterol) and triglyceride levels in particular are decreased with taurine supplementation.

In studies where animals were fed a high-cholesterol diet, taurine supplements reduced both blood and liver cholesterol levels (Yokogoshi et al., 1999). HDL cholesterol was also found to be decreased by taurine by the study of Park and Lee (1998). In the study of Petty et al. (1990), the rabbits (1-1.5 kg) were fed a diet that was 2% cholesterol by weight, but the increase in serum cholesterol levels varied greatly from 440% to 2270%. When Taurine was given as a food additive (4% w/w) or as part of the drinking water (0.5%) for at least 11 weeks, it was found to have no effect on total cholesterol levels in the blood.

In another experiment using larger rabbits (2–2.5 kg) Balkan et al. (2002) demonstrated the hypolipidemic effects of taurine in the rabbit fed a high fat diet. The rabbits were fed a diet consisting of 1% cholesterol (w/w) for 2 months with or without taurine in the food (2.5% w/w). Plasma cholesterol increased by almost 1300%, whereas plasma triglyceride levels rose almost 300%. Taurine treatment reversed the effects of cholesterol treatment on total plasma cholesterol (39.9–31.1 mmol/L) and on plasma triglyceride levels (1.92–1.20 mmol/L) while lipid levels were not restored to control values. The reduction of cholesterol levels is due to increased bile acid conjugation and antioxidant effects. Taurine is incorporated in the bile acid chenodeoxychloic acid, which emulsify the dietary fats (Zhang et al. (2004b)

Cortisol and Oxidative Enzymes Activities

Table 3 showed that summer season increased significantly serum cortisol level and decreased significantly each of serum ATP-ase and Chol.-E-ase enzymes activities as well as glutathione concentration in rabbits as compared to winter season. Regardless the effect of season, Pyrosol sprays caused significant increases in cortisol concentration by 34.5 and significant decreases in ATP-ase and Chol.-E-ase enzymes activities as well as glutathione concentration by 29.0, 21.3 and 16.3, respectively, when compared to control group levels. Adding taurine in drinking water of rabbits decreased significantly cortisol level by 27.6%, and increased significantly ATP-ase, Chol-E-ase and glutathione concentrations by 22.6, 46.8 and 16.8%, respectively, as compared to these levels in control group. Adding taurine with exposed to Pyrosol sprays alleviate the side effect of pesticide on serum cortisol hormone and some oxidative enzymes activities. Pyrosol without taurine caused 34.5% increase in cortisol while with taurine the percentage decrease reach to 10.3% only. In addition, adding taurine with exposed to Pyrosol sprays caused recovering in the decrease in Chol.-E-ase and glutathione concentrations to reach their levels in the control group. Moreover, the decrease in ATP-ase activity due to pyrosol (29.0%) improved by adding taurine in drinking water of rabbits to reach of 16.1%.

Exposing cattle to stimuli that are physically and psychologically stressful activates the hypothalamic-pituitary-adrenal axis, leading to elevated levels of glucocorticoids (Wernicki et al., 2006).

There was a significant inhibition of total ATP-ase activity of small and large intestinal mucosa of broiler chickens exposed to heat stress (41°C, 65% relative humidity for 6 h) as compared to thermoneutral (25°C, 65% relative humidity) conditions (Chun-Lin et al., 1994). High ambient temperature and humidity are the major constraint on animal productivity in tropical and subtropical areas. Oxidative stress commonly Occurs following heat stress in tropical regions and affects farm animals. The oxidative balance is affected during heat stress periods. Fast production of free radicals and reactive oxygen species and/or a decrease in antioxidant defense mechanisms result in oxidative stress (Bernabucci et al, 2002).

These results indicate that the adverse effect of the heat stress had a negative impact on enzymatic activity. Meister (1994) suggested that glutathione has been mediating the initial response for acquiring tolerance to heat stress. Harmon et al. (1997) found that plasma total antioxidant activity decreases when cows are placed in environmentally controlled chambers and exposed to 29.5 °C temperatures for a period of 7 d. The same authors reported that as the temperature humidity index (THI) approaches levels dangerous to livestock, total antioxidant activity declines. Madrigal et al (2001) reported that different kinds of stress result in reduction in the concentration of reduced glutathione (GSH) in animal organs. Lakritz et al. (2002) reported a decrease in GSH and an increase in GSSG in the blood of heat-stressed cattle.

The authors found that mean GSH concentrations for thermoneutral and heat stress were 3.2±0.65 and 2.7±0.62 mmol/L of RBC, respectively and reduced GSH concentrations were associated with reduced feed intake during heat stress period. The same authors concluded that heat stress reductions in feed intake and thermoregulatory effects may induce oxidative stress in cattle. Świderska-Kołacz1 et al (2006) reported that the concentrations GSH in the liver and kidney of three genetic groups of rabbits decreased due to stress of the influence of displacement of animals from cage to cage daily for 30 days but not significantly and concluded that due to adaptative processes in biochemical reaction of stress and/or by long time of experiments. Dehghan et al. (2010) determined serum glutathione level in the ram and its changes during normal and heat stress conditions and reported that glutathione levels change during different environmental

conditions. Verlecar et al. (2007) reported that the decreased values of GSH on long exposures to temperature stress indicate utilization of this antioxidant, either to scavenge oxiradicals or act in combination with other enzymes, was more than its production capacity under heat stress.

Liver supplies most of the plasma glutathione and it is removed from plasma by transpeptidase action which is mostly located in the kidney therefore, glutathione levels may be influenced by different physiological conditions (Pastore et al., 2003). Cholinesterase serves a pivotal role in regulating the transmission of nerve impulses by rapid hydrolysis of the neurotransmitter. Aly et al. (1986) found that heat stress provoked a decrease in Chol.-E-ase activity of the cerebrum region of the gerbil. Osama et al (2007) found that Chol.-E-ase enzyme activity in some central nervous system regions of albino rat newborns was decreased markedly at day 7, 14 and 21 after exposure to high temperature exposure (40°C two hours daily) as compared to thermoneutral temperature (25°C). Osama et al (2007) concluded that the Chol.-E-ase activity was markedly decreased as a result of heat exposure in most cases in all studied CNS regions. Contrary to these observations were found by Rao et al. (1990).

Insecticides, including pyrosol, containing organophosphates work by inhibiting certain important enzymes of the nervous system, especially, cholinesterase. The Chol.-E-ase enzyme is phosphorylated when attached to the phosphorous moiety of the insecticide, a binding that is irreversible. This inhibition results in the accumulation of acetylcholine at the neuron/neuron and neuron/muscle (neuromuscular) junctions or synapses, causing rapid twitching of voluntary muscles and finally paralysis (Salgado, 1997). Some insecticides containing dinitrophenols act by inhibiting oxidative phosphorylation which basically prevents the formation of the high-energy phosphate molecule (ATP). Their mode of action is that of inhibiting mitochondrial electron transport at the NADH-CoQ reductase site, leading to the disruption of ATP formation, the crucial energy molecule (Sweeney and Klip, 1998). Taurine has a protective effect in heat-induced oxidative stress in rabbits performance by elevating glutathione activities and ameliorates heat-induced oxidative stress in the plasma suppressing lipid peroxidation and restoring glutathione content to their normal physiological levels.

Taurine was found to be effective in (1) increasing glutathione levels that had been diminished by lead; (2) reducing malondialdehyde levels, an end-product of lipid peroxidation and (3) decreasing catalase and erythrocyte G6PD activity, which had been increased by lead exposure (Gürer et al., 2001). Li et al. (2009) found that taurine treatment suppressed the oxidative stress (Oxidative stress parameters i.e. glutathione, malondialdehyde levels, catalase, and glucose-6-phosphate dehydrogenase) activities induced by phenylephrine through the inhibition of NADPH oxidase activation.

Table 3: Effect of Pyrosol Sprays with and without Taurine on Serum Cortisol Hormone and Some Enzymes Activities in Rabbits during Winter and Summer Seasons

Cortisol and Oxidative Stress Enzymes Activity	Climatic Conditions	Without Treatment	Treated with Pyrosol (P)	Treated with Taurine, TR	Treated with P + TR
Cortisol hormone (ng/ml)	Winter	4.9 ± 0.1	6.9 ± 0.1	3.5 ± 0.1	5.9 ± 0.1
	Summer	6.6 ± 0.1	8.6 ± 0.2	4.9 ± 0.1	6.9 ± 0.2
	Overall	5.8^{c} ± 0.2	7.8^{a} ± 0.3	4.2^{d} ± 0.2	6.4^{b} ± 0.3
	Change % due to season	+34.7 (P<0.01)	+24.6 (P<0.01)	+40.0 (P<0.01)	+16.9 (P<0.05)
	Change % due to treatment		+34.5 (P<0.01)	-27.6 (P<0.01)	+10.3 (P<0.05)

Table 3: Contd.,

ATP-ase (nmol P_i/min /ml)	Winter	17.0 ± 0.3	12.0 ± 0.2	20.0 ± 0.5	14,0 ± 0.3
	Summer	14.0 ± 0.2	10.0 ± 0.6	18.0 ± 0.4	12,0 ± 0.5
	Overall	15.5^{b}± 0.5	11.0^{d} ± 0.3	19.0^{a}± 0.4	13.0^{c}± 0.2
	Change % due to season	-17.65 (P<0.01)	-16.67 (P<0.01)	-10.00 (P<0.05)	-14.29 (P<0.05)
	Change % due to treatment		-29.0 (P<0.01)	+22.6 (P<0.01)	-16.1 (P<0.05)
Cho. E-ase (unit/ml)	Winter	10.4 ± 0.5	8.6 ± 0.4	12.8 ± 0.5	10.5 ± 0.4
	Summer	8.4 ± 0.4	6.2 ± 0.2	10.8 ± 0.2	7.7 ± 0.3
	Overall	9.4^{b} ± 0.5	7.4^{c} ± 0.5	11.8^{a} ± 0.5	9.1^{b} ± 0.5
	Change % due to season	-19.23 (P<0.01)	-27.91 (P<0.01)	-15.63 (P<0.01)	-26.67 (P<0.01)
	Change % due to treatment		-21.3 (P<0.01)	+35.53 (P<0.01)	-3.2 (P>0.05)
Glutathione (GSH) (µ moles)	Winter	230 ± 8	195 ± 8	260 ± 9	215 ± 10
	Summer	200 ± 10	165 ±11	230 ± 8	185 ± 9
	Overall	215^{b}±10.6	180^{c}±10.2	245^{a} ±7.1	200^{b} ± 9.2
	Change % due to season	- 13.04 (P<0.05)	-15.38 (P<0.05)	-11.54 (P<0.05)	-13.95 (P<0.05)
	Change % due to treatment		-16.3 (P<0.05)	+16.8 (P<0.05)	-7.0 (P>0.05)

ATP-ase =Adenosine triphosphatase enzyme and Ch.E-ase = Cholinesterase enzyme Values in the table are LSM ± SE a, b, c, d LSM with different letters in the same row significantly different at P<0.05.

Liver and Kidney Functions

Concerning the effect of season, Table (4) showed that serum ALT and AST enzymes activities as indicators to liver function and urea-N and creatinine concentrations as expressed to kidney function increased significantly due to exposed rabbits to severe heat stress conditions during summer of Egypt as compared to winter condition. Regardless summer effect, Pyrosol sprays between battaries of rabbits affect negatively liver and kidney functions. Serum AST and ALT activities as well as urea-N and creatinine concentrations increased sharply by 140.9, 70.3, 34.4 and 40.0 %, respectively, due to pyrosol sprays as compared to control group.

Table 4: Effect of Pyrosol Sprays with and without Taurine on Liver (Serum ALT and AST Enzymes Activities) and Kidney (Urea-N and Creatinine Levels) Functions in Rabbits during Winter and Summer Seasons

Liver and Kidney Functions	Climatic Conditions	Without Treatment	Treated with Pyrosol (P)	Treated with Taurine, TR	Treated with P + TR
SALT (u/l)	Winter	14.2±1.1	36.4±1.9	15.7±1.1	23,8±1.5
	Summer	18.6±1.2	42.6±2.5	18.8±1.2	29.9±1.8
	Overall	16.4^{c}±1.4	39.5^{a}±1.9	17.3^{c}±2.0	26.9^{b}±2.2
	Change % due to treatment		+140.9 (P<0.01)	+5.5 (P>0.05)	+64.0 (P<0.01)
	Change % due to season	+31.0 (P<0.01)	+17.0 (P<0.05)	+19.7 (P<0.05)	+25.6 (P<0.01)
SAST (u/l)	Winter	24,8±1.9	44,8±2.1	26,8±1.6	38,8±2.2
	Summer	30.9±1.7	50.2±2.2	31.9±1.8	44.2±2.1
	Overall	27.9^{c}±1.8	47.5^{a}±2.2	29.4^{c}±1.6	40.5^{b} ±2.0
	Change % due to treatment		+70.3 (P<0.01)	+5.4 (P>0.05)	+45.2 (P<0.01)
	Change % due to season	+24.6 (P<0.01)	+12.1 (P<0.05)	+19.0 (P<0.05)	+13.9 (P<0.05)

Table 4: Contd.,

Urea-N (mg/dl)	Winter	22.5±1.2	31.6±1.5	24.5±1.4	30.7±1.8
	Summer	32.7±1.1	42.6±1.3	33.5±1.3	35.9±1.7
	Overall	27.6^{c} ± 1.5	37.1^{a} ± 2.2	29.0^{bc} ±2.1	33.3^{b} ± 2.1
	Change % due to treatment		+34.4 (P<0.01)	+5.1 (P>0.05)	+20.7 (P<0.05)
	Change % due to season	+45.3 (P<0.01)	+34.8 (P<0.01)	+36.7 (P<0.01)	+16.9 (P<0.05)
Creatinine (mg/dl)	Winter	0.9 ± 0.01	1.3 ± 0.02	0.8 ± 0.01	1.2 ± 0.02
	Summer	1.1 ± 0.02	1.5 ± 0.03	1.1 ± 0.02	1.4 ± 0.03
	Overall	1.00^{c}±0.01	1.40^{a} ± 0.02	0.95^{c} ± 0.01	1.30^{b} ± 0.02
	Change % due to treatment		+40.0 (P<0.01)	-5.0 (P>0.05)	+30.0 (P<0.01)
	Change % due to season	+22.2 (P<0.05)	+15.4 (P<0.05)	+37.5 (P<0.01)	+16.7 (P<0.05)

Values in the table are LSM ± SE, a, b, c, d LSM with different letters in the same row significantly different at P<0.05.

Habbeb et al. (1997) reported that urea-N and creatinine levels in NZW rabbits increased significantly due to exposed the rabbits to hot summer season. However, Habeeb et al. (1993) found that urea-N and creatinine levels in Californian rabbits decreased significantly by 15.1 and 20.66%, respectively, as a result to exposed rabbits to hot summer season in Egypt. Lead and cadmium in pyrosol affected the kidneys or liver functions Cadmium from the pyrosol sprays enters the environment through respiratory air, drinking water and food ingredient and is transported to the liver through the blood and bond to proteins to form complexes that are transported to the kidneys Underwood and Suttle (2001). Cadmium accumulates in kidneys, where it damages filtering mechanisms and this causes the excretion of essential proteins and sugars from the body and further kidney damage Underwood and Suttle (2001).

Lead of pyrosol can merely do harm after uptake from food, air or water and then lead can cause several unwanted effects, such as disruption of the biosynthesis of haemoglobin and anemia and Kidney damage (Swarup et al., 2005; Massanyi et al., 2007 and Durgut et al., 2008). Liver and kidney functions were not affected by adding taurine only in drinking water of rabbits. However, adding taurine in drinking water of rabbits with exposed to Pyrosol sprays between battaries alleviate the negative effect of pesticide on liver and kidney functions.

The sharply in increase% of serum AST, ALT, urea-N and creatinine due to pyrosol were 140.9, 70.3, 34.4 and 40.0 % and by adding taurine in drinking water of rabbits, the percentage increase values depressed to 64.0, 45.2, 20.7 and 30.0%, respectively. These results indicated that added taurine to rabbits in drinking water improves their liver and kidney functions. These results may be due to the protective role of taurine against renal toxicity induced by cadmium and lead in pyrosol.In the cell, taurine keeps potassium and magnesium inside the cell, while keeping excessive sodium out. In this sense, it works like a diuretic. Because it aids the movement of potassium, sodium, and calcium in and out of the cell,

Serum Trace Elements

Table 5 showed that heat stress of summer season decreased significantly serum Pb, Cd, Zn and Se concentrations in rabbits of four experimental groups as compared to winter season.

Table 5: Effect of Pyrosol Sprays with and without Taurine on Some Serum Trace Elements in Rabbits during Winter and Summer Seasons

Trace Elements	Climatic Conditions	Without Treatment	Treated with Pyrosol (P)	Treated with Taurine, TR	Treated with P + TR
Pb (ppm)	Winter	3.2 ± 0.01	4.0 ±0.04	3.1 ±0.03	4.1 ± 0.04
	Summer	2.6 ± 0.02	3.6 ±0.02	2.6 ±0.02	3.5 ±0.03
	Overall	2.9^{b} ± 0.03	3.8^{a} ± 0.04	2.9^{b} ± 0.02	3.8^{a} ± 0.04
	Change % due to treatment		+31.0 (P<0.01)	0.00 (P>0.05)	+31.0 (P<0.01)
	Change % due to season	-18.8 (P<0.05)	-10.0 (P<0.05)	-16.1 (P<0.05)	-14.6 (P<0.05)
Cd (ppm)	Winter	5.0 ± 0.02	7.1 ± 0.01	4.9 ± 0.03	6.7 ± 0.03
	Summer	4.4 ± 0.01	5.9 ± 0.02	4.3 ± 0.01	5.9 ± 0.02
	Overall	4.7^{b} ± 0.03	6.5^{a} ± 0.05	4.6^{b} ± 0.03	6.3^{a} ± 0.04
	Change % due to treatment		+38.3 (P<0.01)	-2.1 (P>0.05)	+34.0 (P<0.01)
	Change % due to season	-12.0 (P<0.05)	-16.9 (P<0.05)	-12.2 (P<0.05)	-11.9 (P<0.05)
Zinc (ppm)	Winter	6.8 ± 0.05	6.6 ± 0.05	6.5 ± 0.04	6.8 ± 0.5
	Summer	5.9 ± 0.02	5.6 ± 0.03	5.7 ± 0.03	5.8 ± 0.2
	Overall	6.4^{a} ± 0.05	6.1^{a} ± 0.05	6.1^{a} ± 0.06	6.3^{a} ± 0.06
	Change % due to treatment		-4.7 (P>0.05)	-4.7 (P>0.05)	-1.6 (P>0.05)
	Change % due to season	-13.2 (P<0.05)	-15.2 (P<0.05)	-12.3 (P<0.05)	-14.7 (P<0.05)
Se (ppm×10^{-2})	Winter	2.9 ± 0.02	2.8 ± 0.01	2.9 ± 0.03	2.8 ± 0.02
	Summer	2.5 ± 0.01	2.4 ± 0.01	2.4 ±0.01	2.4 ± 0.01
	Overall	2.7^{a} ± 0.03	2.6^{a} ± 0.03	2.7^{a} ± 0.04	2.6^{a} ± 0.03
	Change % due to treatment		- 3.7 (P>0.05)	0.0 (P>0.05)	-3.7 (P>0.05)
	Change % due to season	-13.8 (P<0.05)	-14.3 (P<0.05)	-17.2 (P<0.05)	-14.3 (P<0.05)

Values in the table are LSM ± SE, a, b, c, d LSM with different letters in the same row significantly different at P<0.05.

Regardless the effect of season, Pyrosol sprays between battaries of rabbits caused significant increases in Pb, Cd concentrations by31.0 and 38.3% as compared to control group. Zn and Se concentrations were not affected due to sprays of pyrosol. Pb, Cd, Zn and Se concentrations in rabbits were not affected by adding taurine in drinking water of rabbits. Pb, Cd concentrations with adding taurine in drinking water of rabbits with exposed to Pyrosol sprays between battaries still higher than control group by 31.0 and 34.0%. Accumulation of heavy metals can have a variety of toxic effects, and taurine reduces the damage caused by excess levels cadmium and lead in rabbits.

Mortality Rate

Concerning the season effect, Table (6) showed that mortality rate increased from 10% during winter season to 27.5% during summer season. From 40 rabbits in four experimental groups, 4 rabbits died during winter experiment while 11 rabbits died during summer experiment. Habeeb et al. (1997) found that survival rate in rabbits decreased from 100% during winter to 72% during summer season. Habeeb et al. (1999) reported similar deterioration effect of summer hot climate on bunnies of acclimatized rabbits during suckling period. Regardless the effect of season, Pyrosol sprays between battaries of rabbits caused significant increases in mortality rate from 10% in control group to 35% with sprays of pyrosol, i.e. From 40 rabbits in four experimental groups, 2 rabbits died in control group while 7 rabbits died with sprays of

pyrosol. Mortality rate was not affected by adding taurine only in drinking water of rabbits. Mortality rate in rabbits decreased from 35% in group exposed to pyrosol without taurine to 20% in group exposed to pyrosol with taurine. From 40 rabbits in four experimental groups, 7 rabbits (3 under winter +4 under summer) died in pyrosol without taurine group while 4 rabbits (1 under winter +3 under summer) died with sprays of pyrosol with taurine. This depression in mortality rate may be due to protective effect of taurine against lead and cadmium side effects

Table 6: Effect of Pyrosol Sprays with and without Taurine on Mortality Rate in Rabbits during Winter and Summer Seasons

Seasons	Mortality Rate	Experimental Groups				Season Effect
		Without Treatment	Treated with Pyrosol (P)	Treated with Taurine, TR	Treated with P + TR	
Winter	Initial No	10	10	10	10	4 from 40 (10%)
	Final No	10	7	10	9	
	Mortality (%)	0.0	30.0	0.0	10.0	
Summer	Initial No	10	10	10	10	11 from 40 (27.5%)
	Final No	8	6	8	7	
	Mortality (%)	20.0	40.0	20	30	
Treatment effect		10.0	35.0	10.0	20.0	---

CONCLUSIONS

Heat stress of summer season in Egypt caused significant decrease in live body weight gain, dry matter intake and feed efficiency as well as serum concentrations of glucose, some trace elements and enzymes activities of ATP-ase, Chol.-E-ase and glutathione and significant increase in daily water intake as well as serum concentrations of cortisol, total cholesterol, urea-N, creatinine, LDL and HDL and enzymes activities of ALT and AST in rabbits of four experimental groups as compared to winter season. Mortality rate in growing rabbits increased from 10% during winter season to 27.5% during summer season.

Pyrosol sprays caused significant decrease in live body weight gain, dry matter intake and daily water intake as well as ATP-ase, Chol.-E-ase enzymes activities and glutathione concentration and caused significant increases in glucose, total cholesterol, LDL, HDL and cortisol concentrations in serum of rabbits. Adding taurine with exposed to Pyrosol sprays alleviate the side effect of pesticide on feed and gain of rabbits Adding taurine increased significantly live body weight gain, dry matter intake and daily water intake. When adding taurine glucose, total cholesterol and HDL concentrations decreased significantly and while when adding taurine plus exposed to pyrosol sprays caused recovering the decrease in glucose level to reach the same level in control group. In addition, adding taurine decreased significantly cortisol level and increased significantly ATP-ase, Chol.-E-ase and glutathione concentrations and when adding taurine with exposed to Pyrosol sprays alleviate the side effect of pesticide on serum cortisol hormone and some oxidative enzymes activities. Moreover, Pyrosol sprays affect negatively liver and kidney functions but when adding taurine with exposed to Pyrosol alleviate the negative effect of pesticide on liver and kidney functions. Pyrosol sprays caused significant increases in Pb and Cd concentrations as well as significant increases in mortality rate from 10% in control group to 35% with sprays of pyrosol and decreased to 20% in group exposed to pyrosol with taurine.

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