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EFFECTS OF DIETARY SUPPLEMENTATION WITH TAFLA ON HEAT STRESS, GROWTH PERFORMANCE, BLOOD CONSTITUENTS AND CARCASS TRAITS IN NZW RABBITS UNDER EGYPTION ENVIRONMENTAL CONDITIONS.

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Fifty New Zealand White (NZW) weaned male rabbits 35, days of age with average body weight 637 +10.2 g were used to study the effect of adding different levels of tafla to their diets on heat stress, growth performance, blood constituents and carcass traits. The rabbits were randomly allotted to 5 treatment groups, 10 animals in each. The first group was used as a control and fed a commercial basal diet containing 28% alfalfa hay,18% barley grains, 18% soybean meal, 25% wheat bran, 6 % yellow corn and 3% molasses. The second, third, fourth and fifth groups were fed the basal diet supplemented with 2, 4, 6 and 8 % tafla, respectively. The experiment lasted from weaning (5 weeks old) until 13 weeks of age. Growth performance, carcass traits, blood biochemical analysis, rectal temperature and respiration rate were measured.

The results showed that the final live body weight, daily body weight gain and daily feed intake were significantly ($P< 0.01$) increased in the rabbit groups fed diets supplementation with tafla clay at levels of 2, 4, 6 or 8 %. Also feed conversion and water intake were significantly ($P< 0.05$) improved by feeding tafla diets than in the control group. Rectum temperature and respiration rate were not affected by adding tafla clay at different levels in the control diet.

Dressing % of rabbits was not affected significantly by adding tafla to the basal diet at any level. The blood serum total protein, albumin, ALT and AST levels were significantly higher ($P<0.05$), while the serum levels of globulin, urea-N, creatinine, RBCs, WBCs and Hb were not affected significantly in rabbits fed tafla diets.

Results of the study indicate that dietary supplementation with tafla clay up to 4% is effective to improve growth performance of NZW rabbits under the hot climate conditions of Egypt in summer season.

Key words: Blood biochemistry, carcass , growth, tafla clay.

The environmental conditions play important role in production cycle of rabbits. The domestic rabbits are homothermic mammals. It has high metabolic rate due to their developed sweat glands and slow heat loss. The thermo neutral zone of growing rabbits (6-12weeks of age) is between 15-18 C (Rafai *et al.*, 1972) The high temperature in hot climate conditions negatively affects growth performance and feed intake (Ayyat *et al.*, 1997, Marai *et al.* 1999 and 2006 and Abdel-Monem 2001).

Many physical, physiological and nutritional techniques were applied to ameliorate heat stress in rabbits under the hot summer conditions in Egypt (Marai *et al.*, 1994 and 1999, Tharwat *et al.*, 1994 and Ayyat *et al.*, 1997). Supplementation with tafla clay may be used as a nutritional technique to enhance growth rate through improving the digestibility of ration nutrients by increasing the reactive surface area of nutrients and so promoting the action of digestive enzymes in the digestive tract (shwson *et al.* 1984 and Kirilov and Burikhonov,1993).

The present work aimed to study heat stress and growth performance parameters of growing NZW male rabbits as affected in summer of Egypt by dietary supplementation with tafla clay at levels of 0, 2, 4, 6 and 8% of the diet.

MATERIALS AND METHODS

This study was carried out at a Rabbit Research Unit, Department of Animal Production, Institute of Efficient Productivity, Zagazig University, Zagazig Egypt. The experiment was initiated on July and terminated on August, 2007.

Fifty New Zealand White (NZW) weaned male rabbits of 35 days of age were randomly allotted to 5 treatment groups with 10 animals in each. The first group was used as a control and fed a basal commercial pelleted diet containing 28% alfalfa hay,18% barley grains, 18% soy bean meal(44%), 25% wheat bran, 6 % yellow corn and 3% molasses. The second, third, fourth and fifth groups were fed the basal diet supplemented

with 2, 4, 6 and 8 % tafla clay, respectively. The experiment lasted from weaning (5 weeks old) until 13 weeks of age.

Averages of ambient temperature and relative humidity at midday inside the rabbitry building during the experimental period were, 27.45 °C and 75.3% in the hot period, respectively.

The rabbits were fed *ad libitum* a commercial basal pelleted diet met the nutrients requirements of growing rabbits according to NRC (1977). All rabbits were kept under the same managerial, hygienic and environmental conditions. The rabbits were reared in wire cages, in a well ventilated building and fresh water was automatically available all the time by stainless steel nipples fixed in each cages. All rabbit cages were equipped with feeders. The total artificial light during the experiment was about 16 hours/day.

The rectal temperature and respiration rate were measured in rabbits once every two weeks at 9-11 a.m. Respiration rate was recorded by a hand counter, which counts the frequency of the flank movement per minute. Internal body temperature was taken by medicine thermometer inserted into the rectum for 2 minutes at depth of 2 cm. At the end of the experimental period three rabbits from each group were randomly taken for slaughter. After complete bleeding, pelt, viscera and tail were removed and the carcass and some carcass components were weighted. The blood samples were collected from rabbits during the slaughter and the plasma was separated by centrifugation at 3000 rpm for 20 minutes and kept in a deep freezer at -20 C until the time of analysis. Total protein, albumin, creatinine and urea-N concentrations in plasma were estimated using commercial kits (Bio Merieux, France) according to the procedure outlined by the manufacturer. The globulin values were obtained by subtracting the values of albumin from the corresponding values of total protein.

In order to study the combined effects of temperature and humidity, temperature humidity index (THI) was calculated according to the formula of Marai *et al.* (2001a) as follows:

THI= db C^o-{(0.31-0.31RH)(db C^o-14)}, where db C^o = dry bulb temperature in Celsius and Relative humidity RH = RH % /100. The estimated values of THI were classified as follows:

<22.2 = absence of heat stress, 22.2–<23.2= moderate heat stress, 23.3 –<25.5 = severe heat stress and 25.5 and more = very severe heat stress.

Table 1: Ingredients and chemical analysis of the basal diet (control) fed to growing NZW rabbits during the experimental period.

Ingredients	%
Alfalfa hay	28
Barley grains	18
Soybean meal (44%)	18
Wheat bran	25
Yellow corn	6
Molasses	3
Limestone	1.1
Sodium chloride	0.3
Vitamin and mineral premix*	0.6
Total	100.00
Approximate chemical analysis**	
Dry matter	90.83
Crude protein	18.18
Ether extract	2.29
Crude fiber	13.43
Nitrogen-free extract	49.38
Ash	7.55
Digestible energy***	2656.00

*Each kg of vit and mineral mixture contained: Vit A.2000.000 IU; E10.000 mg; B_1 400 mg; $B_2$1200 mg; B_6 400 mg; B_{12} 10 mg; $D_3$180000 IU; Coline chloride240 mg; Pantothenic acid 400 mg; Niacin 1000 mg; Folic acid 1000 mg; Manganese 1700 mg; Zinc 1400 mg; Iron 15 mg; Copper 600 mg; Selenium 20 mg; Iodine 40 mg and Magnesium 8000 mg.

** Chemical analysis were performed according to A.O.A.C.(1980)

***Calculated according to N.R.C.(1977).

The data of body weight, daily body gain, blood biochemical analysis, rectal temperature and respiration rate were statistically analyzed according to Snedecor and Cochran (1982) as following:

$$X_{ij} = \mu + T_i + e_{ij}$$

Where, X_{ij} = An observation, μ = General mean, T_i= Fixed effect of i^{th} treatments=(1, ... ,5) and e_{ij} = Random error.

Differences among means were tested by Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Effect of tafla supplemented diets on:

1- Heat stress in rabbits:

Temperature – humidity index values (THI) recorded an average of 25.1 at hot periods, indicate exposure of rabbits to severe heat stress during the two months of experimental in summer (July and August). Marai *et al.*(1996) found that NZW rabbits were under severe heat stress during the summer season in Egypt.

However, data in Table 2 show that rectum temperature and respiration rate of rabbits were not affected significantly by feeding tafla diets compared to those fed the control diet.

2- Growth performance of rabbits:

The final live body weight and daily body gain were significantly ($P< 0.01$) increased by dietary supplementation with tafla clay at the different levels (Table 3). The data show that the final live body weight and the daily body gain were increased with increasing the tafla levels, being the highest ($P < 0.o5$) with rabbits fed 6 % tafla supplemented diet.

The daily feed intake, feed conversion rate and water intake were improved ($P<0.01$ or 0.05) by rabbits fed the tafla diet compared to those fed the control diet.

The obtained results were agree with those recorded by Marai *et al* , (1999 and 2001b) and Gabr *et al.* (2003), who reported that live body weight and body weight gain in growing animals were significantly ($P < 0.05$ and 0.01) increased by feeding diet supplemented with tafla clay at levels of 2, 4 and 6% as compared with the control group. Improving body weight gain by addition of Tafla clay might be interpreted by its role in decreasing rate of digesta passage (Grim, 1968, Abd El-Baki *et al*, 1988 and 2001 and Nower *et al*, 1993), increasing digestibility and nutrients absorption in animals (Abd El-Baki *et al*, 1988) and improving nitrogen utilization (Britton *et al.*, 1978).

The final margin was increased by dietary supplementation of tafla clay at levels of 2, 4, 6 or 8 % compared with the control (Table 3). However, the best obtained margin was with those rabbits fed 4% tafla supplemented diet.

Table 2. Physiological parameters (X± SE) of growing NZW rabbits as affected by feeding a basal diet supplemented with different level of tafla ,under Egyptian summer conditions.

Items	Tafla levels (%)in the basal diet					
	Control (0.0 %)	2 %	4 %	6 %	8 %	Sig
Rectum temperature (RT)	40.2±0.09	39.7±0.08	39.8±0.07	39.9±0.09	39.9±0.08	NS
Respiration rate (RR)	116.7±2.7	116.2±2.9	116.4±2.1	115.8±2.0	115.6±2.2	NS
RR/RT	2.90	2.93	2.92	2.90	2.90	
RT%	100	98.76	99.00	99.25	99.25	
RR%	100	99.57	99.74	99.23	99.06	

a, b and c Means in the same row bearing different letters, differ significantly ($P< 0.05$).
N S = Not significant, * ($P< 0.05$), **($P< 0.01$) .

Table 3. growth performance parameters (X± SE) of growing NZW rabbits as affected by feeding a basal diet supplemented with different level of tafla ,under Egyptian summer conditions.

Items	Tafla levels (%)in the basal diet					
	Control (0.0 %)	2 %	4 %	6 %	8 %	Sig
Feed intake (g/day)	83.7^{c} ±1.8	94.2^{b}±2.4	99.9^{b}±2.9	101.6^{a} ±3.4	103.1^{a} ±3.6	**
Feed conversion (g feed/g gain)	5.06^{b} ±0.09	4.66^{a} ±0.07	4.58^{a} ±0.09	4.62^{a} ±0.07	4.64^{a} ±0.1	*
Water intake (ml /day)	126.4^{b} ±4.3	142.1^{a} ±3.8	151.6^{a} ±4.6	155.9^{a} ±5.1	163.2^{a} ±4.9	*
Live body weight (g)at:						
5 weeks old	630.4±9.02	640.8±7.1	635.9±11.4	638.7±10.2	641.5±13.2	NS
9 weeks old	1139.3^{c}±17.8	1215.9^{b}±18.1	1263.5^{a}±24.4	1299.2^{a}±19.7	1337.1^{a}±30.5	**
13 weeks old	1554.7^{c}±31.6	1773.3^{bc}±40.3	1857.9^{b}±43.6	1869.7^{a}±51.1	1885.4^{a}±57.4	**
Live bod weight gain at:						
5-9 weeks old	18.18±0.52	20.54±0.73	22.41±0.91	23.59±0.83	24.84±1.13	**
9-13 weeks old	14.84±0.46	19.91±0.77	21.23±0.78	20.38±0.45	19.58±0.55	**
5-13 weeks old	16.51±0.49	20.22±0.96	21.82±1.04	21.98±0.69	22.21±0.83	**

a, b and c Means in the same row bearing different letters, differ significantly ($P< 0.05$).
N S = Not significant, * ($P< 0.05$) , ** ($P< 0.01$) .

3- Blood biochemical components:

The data in Table 4 show that the level of serum total protein, albumin, ALT and AST were significantly ($P<0.05$) higher, while the serum globulin, urea-N, creatinine, RBCs, WBCs and Hb were not affected in rabbits fed the tafla diets. All the data of blood parameters were within the normal range. These results agree with those obtained by Nowar *et al*, (1993) and Abd El-Baki *et al*, (2001),who found that serum GPT was increased by addition of tafla clay to animals feed.

4- Carcass traits:

The dressing % was improved in the rabbit groups fed tafla diets as shown in Table 5. The same trend was observed by Marai *et al* , (1999).

Table 4. Blood serum parameters (X± SE) of growing NZW rabbits as affected by feeding a basal diet supplemented with different level of tafla, under Egyptian summer conditions.

Items	Tafla levels (%) in the basal diet					
	Control (0.0 %)	2 %	4 %	6 %	8 %	Sig
Total protein (g/100ml)	6.4 ^{b}±0.80	6.9 ^{a}±0.48	6.9 ^{a}±0.91	7.3 ^{a} ±0.63	7.1 ^{a}±0.67	**
Albumin (g/100ml)	3.1 ^{b}±0.21	3.6 ^{a}±0.26	3.8 ^{a}±0.16	4.0 ^{a}±0.28	3.9 ^{a}±0.20	*
Globulin (g/100ml)	3.3 ±0.11	3.3 ±0.14	3.1 ±0.15	3.1 ±0.18	3.2 ±0.16	NS
Kidney function :						
Creatinine	1.4±0.72	1.4±0.64	1.5±0.49	1.7±0.91	1.5±0.87	NS
Urea-N	54.4 ±4.3	53.9 ±4.6	56.5 ±3.4	55.2 ±3.7	57.1 ±3.5	NS
Liver function :						
AST(ul)	15.0^{ab}±2.3	16.5^{a} ±2.5	16.0^{ab}±2.9	17.1^{a} ±2.8	16.9^{a} ±3.1	*
ALT(ul)	9.3 ^{b}±1.8	11.1 ^{a}±1.7	11.4 ^{a}±1.4	11.7 ^{a}±2.1	11.9 ^{a}±1.9	*
Blood picture :						
RBCs	40.2±0.09	39.7±0.08	39.8±0.07	39.9±0.09	39.9±0.08	NS
WBCs	116.7±2.7	116.2±2.9	116.4±2.1	115.8±2.0	115.6±2.2	NS
HB	13.1±0.41	12.9±0.45	12.7±0.36	13.2±0.39	13.0±0.28	NS

Means bearing different letters in the same column within each classification, differ significantly (P≤0.05).

** = $P<0.01$, * = $P<0.05$ and NS = Not significant

Table 5. Carcass traits (X± SE) of growing NZW rabbits as affected by feeding a basal diet supplemented with different level of tafla, under Egyptian summer conditions.

Items	Tafla levels (%) in the basal diet				
	Control (0.0 %)	2 %	4 %	6 %	8 %
Pre-slaughter body weight	1554.7	1773.3	1857.9	1869.7	1885.4
Carcass weight	932.82	1134.91	1217.64	1215.31	1219.66
Carcass weight %	100	121.66	130.53	130.28	130.75
Dressing %	60	64.00	65.54	65.00	64.69

Conclusively, from these results it could be concluded that dietary supplementation with tafla clay up to 4% can be recommended to improve growth performance of NZW rabbits under the hot climate conditions of Egypt in summer season.

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تـأثير إضافة الطفلة لعلائق الأرانب النيوزيلندي البيضاء علي الأجهاد الحراري ومعدل النمو ومكونات الدم وصفات الذبيحة تحت ظروف البيئة في مصر

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أستخدم في هذه الدراسة ٥٠ أرنب نيوزيلندي ابيض ذكر عمر ٣٥ يوم ومتوسط وزن ٦٣٧ +١٢,٢ جرام لدراسة تأثير إضافة مستويات مختلفة من الطفلة لعلائق الأرانب علي الأجهاد الحراري ومعدل النمو وومكونات الدم وصفات الذبيحة٠ قسمت الأرانب عشوائيا إلي خمس مجموعات تجريبية في كل مجموعة ١٠ أرانب ٠ استخدمت المجموعة الأولي للمقارنة (كنترول) وغذيت علي العليقة التجارية القاعدية والتي تحتوي علي ٢٨ % دريس برسيم و ١٨% شعير و١٨% فول صويا و ٢٥ % ردة قمح و٦% أذرة صفراء و٣% مولاس٠ المجموعات الثانية والثالثة والرابعة والخامسة غذيت علي العليقة القاعدية التجارية مضافاً اليها الطفلة بمستويات ٢ و٤و ٦و ٨ % علي التوالي٠ تم قياس معدل النمو وصفات الذبيحة و تحليل الدم ودرجة حرارة المستقيم ومعدل التنفس٠

أوضحت النتائج الأتي:

١- تحسن معنويا علي مستوي احتمال ١% كل من وزن الجسم واالزيادة اليومية في وزن الجسم ومعدل استهلاك الغذاء اليومي في الأرانب المغذاءعلي علائق مضاف لها الطفلة بمستويات ٢و ٤و ٦ و٨% عن عليقة الكنترول

٢- تحسن معدل التحويل الغذائي والماء المستهلك علي مستوي احتمال ٥% في الأرانب المغذاه علي علائق تحتوي الطفلة مقارنة بمجموعة الكنترول

٣- لم يتأثر معنويا كل من درجة حرارة المستقيمن ومعدل التنفس بإضافة الطفلة لعلائق الأرانب بمستوياتها المختلفة

٤- لم يتأثر معنويا نسبة التصافي بإضافة الطفلة لعلائق الأرانب بمستوياتها المختلفة

٥- تأثر معنويا علي مستوي احتمال ٥ % كل من البروتين الكلي والألبيومين وانزيمات الكبد في سيرم الدم بإضافة الطفلة إلي علائق الأراني بينما لم يتأثر كل من الجلوبيولين واليوريا والكرياتينين وكرات الدم البيضاء والحمراء والهيموجلوبين ز

تشير النتائج إلي أن إضافة الطفلة إلي العليقة حتي مستوي ٤% أدت إلي تحسين معدلات النمو في الأرانب النيوزيلندي البيضاء تحت ظروف الجو الحار في مصر في موسم الصيف٠