
Effect of Season on Californian rabbit doe performance

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ABSTRACT

Forty doe of Californian (Cal) rabbits aged 6 months were used to investigate the effect of season on doe rabbit's performance

The results of the present work could be summarize as follows; does reared under hot conditions significantly ($P < 0.05$ or 0.01) consumed less feed and more of water in comparison with those reared under other seasons. Rectum temperature and respiration rate significantly ($P < 0.05$) improved during the mild (winter, spring, autumn and summer) environmental conditions than the hot one. Gestation period significantly ($P < 0.05$) varied according to the environmental conditions. Litter size and litter weight (gm) at the different season studied were significantly ($P < 0.05$ and 0.01) higher during the mild conditions than the hot season. Total protein, albumin, globulin, total lipids, T_3 and T_4 were insignificantly affected by each of environmental conditions.

Key words: Season, doe reproductive performance

Introduction

There is no doubt that rabbit farming has significant potential and useful contribution in improving meat supply and food security in developing countries. Although there is an increasing interest in enterprises of raising rabbits with different sizes in Egypt, several difficulties and constraints stand against the successfulness of these enterprises (Abdel-Monem *et al.*, 2007).

Heat stress is one of the most serious problems facing rabbit production in Egypt; it influences each of animal welfare, performance, yield and quality of products (El-Maghawry, 1990; Abdel-Monem, 1995; Ayyat and Marai, 1998; Barakat, 2001; Azoz and El-Kholy, 2006 and El-aaser, 2007).

The aim of this work this work to study the effect of season on Californian and doe rabbits performance under Egyptian condition.

Materials and Methods

The present work was carried out at a commercial farm in zagazig area, sharkia governorate, Egypt.

Forty does of Californian (Cal) at six months of age were used in a completely randomized design experiment to study the effect of seasons (summer, winter, spring and autumn) on performance of Cal doe rabbits under Egyptian environmental conditions. Doe rabbits were randomly distributed into fore experimental groups with 10 does in each season, nearly equal in average body weight.

The experimental diet consisted of 28% alfalfa hay, 18% barley, 18% soybean meal (44%), 25% wheat bran, 6% yellow corn, 3% molasses, 1.1% limestone, 0.3% sodium chloride, 0.6% vitamin and mineral premix. The basal diet contained of 18.18% crude protein, 13.43% crude fiber, 2.29% ether extract, 2656.00 digestible energy (kcal/kg).

All rabbits were kept under the same managerial, hygienic and environmental conditions. Does were individually reared in wire cages and their offspring's were collectively raised in cages, in the same batteries, in a well ventilated building, fresh water was automatically available all the time by stainless steel nipples fixed in each cages. All doe cages were equipped with feeders and nipples. At mating rabbits were individually transferred to the buck cages for copulation and returned to their own hatches, each doe was palpated at 10 days post-mating to be rebred until pregnancy was establish. Within 12 hours after kindling, litter kits were recorded and weaned at 30 days of age.

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The traits studied for does were gestation length, feed and water consumption during gestation and suckling period, litter sizes and weight at each of birth, 21 and 30 days (weaning) of age, litter weight gain and mortality rate of pups from birth to 30 days of age were recorded. Rectal temperature and respiration rate were measured in does once every two weeks at 9-11 a.m. Respiration rate (breath / minute) 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, blood samples were collected from the marginal ear vein of does after shaving and cleaning with alcohol in less than 2 minutes into dry clean centrifuge tubes containing some drops of heparin. 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, T3 and T4 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.

The data of doe performance, blood analysis, rectum temperature and respiration rate were analyzed statistically according to Snedecor and Cochran (1982) as following:

$$X_{ijkl} = \mu + S_i + E_{ij}$$

Where, X_{ijk} = an observation, μ = Overall mean, S_i = Fixed effect of i th seasons and E_{ij} = Random error. The differences among means were tested by Duncan's multiple range test (Duncan, 1955).

Results and Discussion

1. Feed and water intake:

It is evident from the results presented in Table 1 that does reared under summer condition significantly ($P < 0.05$ or 0.01) consumed less feed and more of water in comparison with those reared under other seasons. Where, feed consumption decreased in the summer conditions by 23.76%, while water intake was increased by 40.77% under the same conditions than the winter season. Depression in feed consumption is the most reaction to heat exposure (Marai and Habeeb, 1998). Such depression in feed intake during hot period may attributed to the high environmental temperature which stimulates peripheral thermal receptors to transmit suppressive nerve impulses to the appetite centre in the hypothalamus causing the decrease in feed consumption (Abdel-Monem *et al.*, 2007). Stefan *et al.* (1979) indicated that rabbit feed intake increases by feeding during cool natural temperature and thermal regulation by air current. Stephan (1980) estimated the increase in water requirement by 50% as temperature rose from 18 to 38 °C.

Table 1: Means and standard errors ($\bar{X} \pm$ S.E.) for feed and water intake of Californian doe rabbits as affected by season of year.

Items	Feed intake	Water intake
Seasons:		
Summer	85.97±1.3	310.11±35.12
Winter	105.43±1.5	142.96±28.76
Spring	101.49±0.9	271.82±31.54
Autumn	103.69±1.1	215.93±25.87
Sig.	*	*

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

Means bearing different letters in the same column within each factor differ significantly ($P \leq 0.05$).

2. Rectum temperature and respiration rate:

It could be observed from the results obtained in Table 2 that each of rectum temperature and respiration rate significantly ($P < 0.05$) improved during the mild environmental conditions (winter, spring and autumn) than the hot one (summer). However, dissipation of heat through respiratory water vapour is decreased by the increase in ambient temperature and humidity (Lebas *et al.* 1986). The increase in rectal temperature of the heat stressed rabbits may be due to either poor ability of the animals to prevent the rise in rectal temperature or to failure of the physiological mechanisms of animals to

balance to balance the excessive heat load caused by exposure to high ambient temperature. (Habeeb *et al.*, 1992).

Table 2: Means and standard errors ($\bar{X} \pm$ S.E.) for rectum temperature and respiration rate of Californian doe rabbits as affected by season of year.

Items	Rectum temperature	Respiration rate
Seasons:		
Summer	39.89±0.07	109.82±1.4
Winter	39.04±0.4	94.65±.09
Spring	39.41±0.4	100.91±1.0
Autumn	39.11±0.3	98.61±1.1
Sig.	*	*

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

Means bearing different letters in the same column within each factor differ significantly ($P \leq 0.05$).

3. Doe traits and their young:

Results in Table 3 indicate that gestation period significantly ($P < 0.05$) varied according to the seasons. The present results are in accordance with those reported by Bassuny (1999); Mahrose (2000) and El-aaser (2007).

Data found in the same Table also revealed that each of litter size and litter weight (gm) at the different ages studied were significantly ($P < 0.05$ and 0.01) higher during the mild conditions (winter, spring and autumn) than the hot one (summer). Abdel-Samee *et al.* (2005) concluded that exposing adult female rabbits to severe heat stress significantly decreased litter size and weight at birth and at weaning as well as mean bunny weight. Mahrose (2000) attributed the decrease in each of litter size and litter weight to the poorer weather conditions and the decrease in the doe viability during hot conditions.

Table 3. Means and standard errors ($\bar{X} \pm$ S.E.) for some Californian doe traits and their young as affected by season of year.

Items	Gestation period	Litter Size			Litter weight at		
		Birth	21 day	Weaning	Birth	21 day	Weaning
Seasons:							
Summer	30.85±0.13	3.47±0.17	1.79±0.06	1.01±0.09	138.7± 5.47	381.4± 9.87	409.9±10.0
Winter	30.92±0.18	6.93 ±0.25	4.74 ±0.11	3.71 ±0.13	365.4 ±8.25	1533.3 ±20.1	2485.4 ±34.8
Spring	30.57±0.12	4.45±0.18	3.48±0.13	2.82±0.14	192.0±9.02	821.6±10.4	1403.0±23.1
Autumn	30.07 ^b ±0.14	5.91±0.20	4.31±0.15	3.76±0.16	293.8±11.32	1284.9±15.4	2167.1±29.5
Sig.	NS	**	**	*	**	**	*

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

Means bearing different letters in the same column within each factor differ significantly ($P \leq 0.05$).

4. Blood components and hormones:

Total protein, albumin, globulin, total lipids, T3 and T4 were not significantly affected by seasons, (Table 4). The present results disagree with those found by Abdel-Monem (1995), Mahrose (2000), Attia (2004) and Azoz and El-Kholy (2006) who obtained significant differences in the present blood components due to season effects.

Table 4: Means and standard errors ($X \pm$ S.E.) for blood components of Californian doe rabbits as affected by season of year

Items	Total protein g/dl	Albumin g/dl	Globulin g/dl	Total lipids	T3 (ng/100 ml)	T4 (ng/100 ml)
Seasons:						
Summer	6.01±0.09	4.65±0.13	1.36±0.08	307.79±3.71	1.93±0.15	7.39±0.36
Winter	6.21±0.15	4.49±0.38	1.72±0.07	325.83±2.96	1.69±0.17	6.82±0.07
Spring	6.29±0.17	4.38±0.21	1.91±0.30	326.54±4.12	1.86±0.10	6.88±0.21
Autumn	6.43±0.31	4.76±0.34	1.67±0.21	328.19±2.82	1.90±0.14	6.56±0.09
Sig.	NS	NS	NS	NS	NS	NS

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

Means bearing different letters in the same column within each factor differ significantly ($P \leq 0.05$).

References

- Abdel-Monem, U. M., 1995. Heat stress effects and their amelioration on some traits of rabbits under Egyptian summer conditions in Egypt. M. Sci. Thesis, Fac. Agric., Zagazig Univ., Egypt.
- Abdel-Monem, U. M., B. Abdel-Ghany and M. Mahrose, Kh., 2007. Effects of feeding times on performance of New Zealand White rabbit does. The 5th Inter. Con. on Rabbit Prod. In Hot Clim., Hurgada, Egypt, 4 – 7 December.
- Abdel-samee, A. M., A. M. Ali, R. M. Mousa, and M. A. Abdel Ghaffar, 2005. Productivity and reproductivity of heat stressed rabbits as influenced by nutritional treatments under Sinai Conditions. The 4th Inter. Con. on Rabbit Prod. In Hot Clim., Sharm El-Sheikh, Egypt. pp: 225 – 231.
- Attia, I. E. I., 2004. Effect of some factors on physiological and productive process of rabbits. M. Sci. Thesis, Fac. Agric., Zagazig Univ., Egypt.
- Ayyat, M. S. and I. F. Marai, 1998. Evaluation of application of the intensive rabbit production system under the sub-tropical conditions of Egypt. *World Rabbit Science*, 6 (1): 213 – 217.
- Azoz, A. A. and K. H. El-Kholy, 2006. Reproductive performance and blood constituents of V-line and Bouscat female rabbits under middle Egypt conditions. *Egypt. J. Rabbit Sci.*, 16 (1): 139- 160.
- Barakat, A. E., 2001. Study of some factors affecting on doe and reproductive traits in meat rabbits. Ph.D. Thesis, Fac. Agric., Zagazig Univ., Egypt.
- Bassuny, S. M., 1999. Performance of doe rabbits and their weanings as affected by heat stress and their alleviation by nutritional means under Egyptian conditions. *Egypt. J. Rabbit Sci.*, 9: 73 – 86.
- Duncan, D. B., 1955. Multiple range and multiple F-test. *Biometrics*. 11: 1 – 42.
- El-aaser, M. A., 2007. Effect of season and feeding level on rabbits performance. M. Sci. Thesis, Fac. Agric., Zagazig Univ., Egypt.
- El-Maghawry, A. M., 1990. Genetical and environmental factors affected the performance of broiler rabbits. Ph. D. Thesis, Fac. Agric., Zagazig Univ., Egypt.
- Habeeb, A. A. M., A. M. El-Maghawry, I. F. M. Marai and A. E. Gad, 1998. Physiological thermoregulation mechanism in rabbits drinking saline water under hot summer conditions. In: *Proceeding of First Inter. Conf. on Indigenous Versus Acclimatized Rabbits*, 7 – 9 September, El-Arish, North Sinai, Egypt. pp: 443 – 456.
- Habeeb, A. A. M., I. F. M. Marai and T. H. Kamal, 1992. Heat stress. In: Philips, C., Piggins, D. (Eds), *Farm Animals and the Environment*. CAB International, pp. 27 – 47.
- Lebas, F., P. Coudert, R. Rouvier and H. de Rochambeau, 1986. *The rabbit, Husbandry, Health and Production*. FAO, Animal Production and Health Series.
- Mahrose, Kh. M., 2000. Environmental studies on growth and reproduction traits in rabbits. M. Sci. Thesis, Fac. Agric., Zagazig Univ., Egypt.
- Marai, I. F. M. and A. A. M. Habeeb, 1998. Adaptation of Bos Taurus cattle under hot climate conditions. *Ann. Arid Zone*, 37 (3): 253-281.
- Snedecor, G. W. and W. G. Cochran, 1982. *Statistical Methods*. 7th Ed. Iowa State Univ. Press. Ames. Iowa.
- Stephan, E., 1980. The influence of environmental temperatures on meat rabbits of different breeds. *Proc. World Rabbit Cong.*, 2: 399-409.
- Stefan, E., W. Schlolaut, and K. Lange, 1979. Schurleistung, Futter und Wasseraufnahme bei manallechem angorakaninchen unter verschiedenner Temperature bedingungen. III. Arbeiten Tag. Veterinary Gesllschaft Cellular.