International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 7.502 Impact factor
Volume-11| Issue-6| 2023 Published: |22-06-2023|

UDC 636.0631.636.92

ADAPTABILITY OF RABBITS TO HOT CLIMATE CONDITIONS

https://doi.org/10.5281/zenodo.8091002

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Abstract.
The article describes the results of research on clinical and haematological parameters of acceleration rabbits by seasons of the year when growing in the hot climate of Uzbekistan. The degree of heat tolerance and coefficient of endurance under different rearing systems have been determined.

Key words
rabbits, males, young, body temperature, pulse, respiratory rate, heat tolerance, endurance, hematology.

Introduction. Rabbit breeding is a promising branch of animal husbandry. Rabbits give tasty dietary meat, valuable raw fur and down, while using cheap and available feed: grass, hay, twig fodder, some grain, while in poultry farming only grain. For the production of 1 kg of weight is spent 3 k.u., this is more than in poultry 2 k.u., but much less than in pork, bacon 5-6 k.u., beef 6-7 k.u. Paying forage 2.3 times better than cattle. Among all types of meat, rabbit meat ranks among the first in protein nutrition, juiciness, tenderness, taste and digestibility, second only to turkey. There is less collagen and elastin in rabbit meat than in the meat of other animals, and this increases the level of complete proteins. Therefore, rabbit meat is more easily digested by the human body. Rabbit meat has all the essential amino acids. Rabbit meat is white, meaning it contains little myoglobin. Protein is 20-22%.

In different geographical and climatic zones, with different forage and other conditions, each zone has its own characteristics. Too high as well as very low temperatures affect the resistance of the organism.

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In this connection, the following tasks were solved: to study the clinical and hematological blood parameters of acceleration rabbits in connection with their adaptation to year-round keeping at high ambient temperatures.

Analysis of different technologies shows a number of advantages of the acceleration method of keeping and breeding rabbits. Growing rabbits in rabbit houses involves the construction of expensive capital premises, high energy costs, which significantly increases the cost of rabbit meat. Growing rabbits indoors leads to a violation of the interaction of the body with the environment, physiological processes are disrupted, including thermoregulation, which leads to a decrease in productivity.

Material and methodology of the study. Studies were conducted at the Center for the Selection and Genetics of Rabbits on two groups of adult rabbits of the Californian breed and young rabbits at the age of 60 days, 10 animals in each. Rabbits were kept in mini-farms on open areas developed in the CCHC with regard to climatic conditions of the country.

Clinical parameters were studied in adult animals and young animals at the age of 60 days in July. Respiration rate, pulse rate and body temperature were determined in the morning, afternoon and evening.

Hematological parameters were studied in adult animals and young animals at the age of 60 days.

The degree of heat tolerance was determined by the refined formula of R. Benezre (1954):

$CT=X_1 +3.69X_2$, where

ST-degree of heat resistance;

X_1 and X_2 are pulse and respiration rate at a given ambient temperature.

Stability (adaptation) coefficient was determined by the formula

$$KA=\frac{Td}{Tu}+\frac{Dd}{Du}, \text{ where}$$

CA- coefficient of endurance (adaptation);

Td is the body temperature of the animal during the daytime hours;

Tu - body temperature in the morning hours;

Breathing rate per minute during the daytime hours;

Du - respiratory rate per minute in the morning hours.

Smaller values of the coefficient of endurance (adaptation) indicate a more pronounced resistance of the animal to the effects of elevated air temperatures.

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Research results. In different geographical and climatic zones, with different forage and other conditions, each zone has its own characteristics. Too high as well as very low temperatures affect the resistance of the organism.

Table 1

Clinical parameters of the studied rabbits

Indicators	Acceleration method			Indoors.		
	Morning	noon	Evening	Morning	noon	Evening
Rabbitmothers						
Body temperature,^{0} C	38,6±0,02	39,2±0,021	38,9±0,019	38,7±0,02	39,4±0,021	38,6±0,019
Heart rate, times/minute	137±3,4	184±5,9	177±6,1	142±3,4	194±5,9	181±6,1
Breathing, times/minute	89±5,2	121±4,8	114±6,7	92±5,2	129±4,8	124±6,7
Males						
Body temperature,^{0} C	38,5±0,014	39,0±0,02	39,1±0,016	39,0±0,014	39,3±0,02	39,1±0,016
Pulse, times/minute	132±5,1	185±6,5	180±7,2	139±5,1	196±6,5	183±7,2
Breathing Frequency, times/minute	79±3,1	117±2,9	98±4,3	89±3,1	131±2,9	118±4,3
60-days old youngsters						
Body temperature,^{0} C	38,4±0,011	38,9±0,23	38,7±0,02	38,5±0,011	39,3±0,23	38,9±0,02
Pulse, times/minute	141±6,8	193±8,6	181±7,5	152±6,8	219±8,6	192±7,5
Breathing Frequency, times/minute	94±5,3	129±4,9	121±5,6	98±5,3	141±4,9	136±5,6

When setting standards, it is necessary to consider not only species, but also breed, age, sex, physiological condition, fatness, suitability, conditions of keeping, feeding and care. It should be considered that high air humidity, both at high and low temperatures have a negative effect on the body's resistance due to violation of heat exchange. High velocity of cold air also disrupts heat exchange and suppresses protective adaptations of the animal's organism. Insufficient supply of fresh air

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disturbs normal respiratory functions. Indicators of the level of natural resistance of animals were lower in reinforced concrete premises.

Physiological indicators related to resistance can also be used to identify resistant animals; it is possible to use the thermoregulatory capacity of the organism for this purpose.

The desire to maintain the internal environment is the most important physiological property of the organism of higher animals. An evolutionary constant is the maintenance of body temperature. In clinical practice, body temperature is the most characteristic indicator reflecting the course of life processes. Thus, body temperature is used as a parameter of animal susceptibility to infections. What is of particular importance is not the absolute body temperature, but how it is maintained when the environmental temperature changes.

Clinical parameters of experimental rabbits are presented in Table 1.

Analyzing Table 1, we found that rabbits reared according to the acceleration method, at air temperature +38^0 C felt more comfortable in the mineral farms than rabbits indoors. The presence of clean air, free access to feed and water, and the absence of stress affected the clinical parameters. The body temperature of female accelerated rabbits was 0.1 lower in the morning; 0.2 lower in the afternoon; and 0.3^0 C higher in the evening than that of rabbits raised indoors. In males, 0.5; 0.3 and 0^0 C, respectively; in 60-day-old rabbits, 0.1; -0.4; 0.2^0 C.

Accelerated rabbits were calmer, with female rabbits having a lower heart rate of 8, 10, 4 beats per minute; males by 7, 11, 3; young males by 11, 23, 11, respectively.

The study of rabbits' body reaction to hot weather by counting respiration rate showed that the rabbits in the mineral farms had better indicators. So the variation of breathing rate per minute in female rabbits during the day was 89-121, which is 3.4-6.6% lower than in rabbits kept indoors. In males this index was 11.9-12.6%, in young animals it was 4.2-9.3%.

Table 2

Heat tolerance indexes of experimental rabbits

Indicators	Growing in		difference +,-
	mini-farms	room	
Bunnycats	465,41±86,2	670,01±102,5	204,6
Males	423,51±77,9	679,39±99,6	255,88
60-day-old youngsters	661,3±91,7	739,29±113,1	77,99

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Rabbits are vulnerable to changes in ambient temperature. The critical environmental temperature, according to many authors, for rabbits is $+35^0$ C. According to groups of international researchers, animal resistance to heat develops more slowly than to cold.

The clinical parameters of the experimental rabbits were within the physiological norm, but there were differences between the groups.

In our studies, the dependence of pulse rate and respiration rate in the morning and afternoon at ambient temperature $+38^0$ C was established, according to which the degree of heat tolerance of rabbits was calculated (Table 2).

The data in Table 2 show that the degree of heat tolerance of the rabbits of accelerator rabbits bred in the mineral farms outdoors was high compared to the rabbits bred indoors. Thus, accelerator rabbits exceeded their female counterparts by 43.7%, males by 60.4% and juveniles by 11.7% according to this indicator. Hematological parameters of experimental groups of rabbits were within normal limits, and there were differences in the groups due to rearing conditions (Table 4).

Rabbits bred outdoors in mineral farms have the best blood morphological indices. Thus, they surpassed their analogues by 4.0% in hemocrit (proportion of erythrocytes from the total blood volume), by 9.9% in hemoglobin concentration. In terms of erythrocyte count, leukocyte count they had a lower value, which indicates a stable course of life processes.

Blood performs a complex and important function in the body - it provides thermoregulation, supplies cells with nutrients and oxygen.

Table 3

4
Morphological indices of the blood of female rabbits

Kursatkichlar	Unit of measure	Symbols	Norma	Content system			
				In mine farms.		Indoors	
				M±m	Cv , %	M±m	Cv , %
Number of leukocytes	*10 /l^9	WBC	5-12,5	9,14±0,29	12,54	9,04±0,29	12,54
Number of lymphocytes	*10 /l^9	Lymph#.	30-85	53,13±1,39	9,64	53,05±1,32	9,64
Number of red blood cells	10 /l^{12}	RBC	5-8	5,49±0,41	22,49	5,64±0,33	22,49
Hemaglobin concentration	g/l	HGB	17-24	22,2±0,32	11,26	20,2±0,59	11,26

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Hemocrit	%	HCT	33-50	42,70±0,8	9,71	38,70±0,9	9,71
Volume of red blood cells	fm	MCV	29-37	35,62±0,7	10,26	33,74±0,8	10,26
Erythrocyte hemoglobin	pg	MCH	17-24	22,6±0,61	10,07	19,3±0,50	10,07
Platelet count	*10 /l⁹	PLT	2,5-6,5	4,74±0,33	21,59	4,24±0,24	21,59
Calcium content	mg/%	Sa	7-12	10,1±0,21	8,1	9,6±0,34	10,4
Phosphorus content	mg/%	P	4,8-6,5	6,9±0,62	9,2	5,3±0,12	9,9

Conclusions. Creation of optimal conditions of keeping and breeding of rabbits on acceleration method in mineral farms in the open air, where there is free access to feed and water, the absence of stress contributes to better tolerance of high air temperature, better adaptation to hot conditions and stable resistance of the organism.

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