

The Reaction of Turkeys of Different Breeds, Ages and Sexes to Hot Weather

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TEN birds of each sex of White Beltsville turkeys were used. Body temperature of females was higher than that of toms during the hot summer months of June and July. The reverse was true in the other items since the males had recorded higher values of skin and feather temperatures and respiration rate.

The younger Bronze toms recorded higher values for all items than adults, except respiration rate which gave reverse result. The higher age difference was in the feather temperature. The least differences observed for all toms were at noon, except respiration rate which became wider. The adults showed wider diurnal variations than young birds.

Ten toms of each of Bronze, White Beltsville and Black Baladi (Indigenous) turkeys were compared with respect to their reaction to hot climates of summer in Egypt. The three breeds showed the same body temperature at noon. The values of the other reactions were less in Black Baladi than in the other two breeds at noon, while the reverse occurred in the other day times. This refers to the capability of Black Baladi to fact wider range of increase in air temperature, a result of acclimatization to hot weather. The comparison of the two imported breeds showed that the Bronze was the most susceptible breed to heat elevation, while the Beltsville exhibited the better resistance.

Breed differences with respect to their reaction to hot weather were not investigated. Sex differences were investigated by Wilson and Woodard (1955) and they found that Bronze females showed slightly higher body temperature than males at air temperature more than 26.7°C. Body temperature at hatching is lower than that of the adult fowl and gradually rises to the adult level as the birds becomes adapted to cooler temperature. This is accomplished by the growth of feathers and the increase in basal metabolic rate per unit surface area (Hutchinson, 1954).

Material and Methods

Sex differences in the reactions of birds during hot summer months were tested in ten of each of white Beltsville. The different reactions of birds and the diurnal variation were studied weekly for 5 successive weeks during June and July.

The reactions of ten adult Bronze males of 12 months old were compared with those of other ten young Bronze ones of 8 weeks of age. The tests were diurnally investigated once weekly for 5 successive weeks during July and August.

To study the difference in thermal reactions between the adult Bronze and White Beltsville breeds which were imported as chicks and the native Black Baladi breed, ten toms of each breed were used. The tests were diurnally carried out for 5 weeks during August and the beginning of September.

Body temperature was measured by clinical mercury thermometers inserted in the cloaca to the depth of 2 cm and left for 2 min. Skin temperature was measured by a surface thermistor thermometer apparatus. The probe was applied to surface for one min before recording temperature. Skin temperature was recorded on three body regions, back, abdomen and caruncles. The same technique was also used to measure feather temperature for the back region. Respiration rate was measured by counting the movements of the abdomen, stop watch and a counter were used to count the rate per min. All the birds were treated alike and fed the same balanced ration. Analysis of variance was done to test the differences between sexes, breeds and ages. Differences were considered significant at 5% level of probability and highly significant at 1% level of probability.

Results and Discussion

Sex difference

The mean body temperature of Beltsville hens was slightly higher than that of toms. The reverse was true in the other items since the males had recorded the highest values especially the respiration rate. However, the sex difference in body temperature disappeared at noon, while that of the respiration rate was augmented. The other items showed low diurnal variations with slight sex difference, mostly higher in males (Table 1). The analysis of variance showed that the sex difference was only significant for body and abdomen skin temperatures and respiration rate. Diurnal variations were highly significant in back feather, abdomen skin and caruncles temperatures and respiration rate, only significant in back skin temperature and non significant in body temperature (Table 2). The higher body temperature of females than that of males observed in this study agreed with that found by Wilson and Woodard (1955) on turkeys, however, they showed that the difference was not statistically significant.

Age difference

The total mean values showed that the 8 weeks old birds had higher temperature in all items studied than the adult ones. The highest temperature was that of back feather temperature followed by body temperature, abdomen skin, back skin and caruncles temperatures. The reverse was found in respiration rate since it was remarkably high in the adult birds than the younger birds. At all day times the young birds also exhibited higher temperatures for all items; the least age differences were observed at noon while the highest were

TABLE 1. Mean value of the body reactions of male and female Eeltsville turkeys in Summer

Items	Morning		Noon		Evening		Average	
	Male	Female	Male	Female	Male	Female	Male	Female
	Air temperature °C	28.7		37.2		27.8		
Body temperature °C	41.0	41.2	41.1	41.1	41.0	41.3	41.0	41.2
Back skin temp. °C	37.4	37.0	38.5	38.4	37.7	37.3	37.9	37.6
Abdomen skin temp. °C	37.8	37.7	39.2	38.8	38.0	37.9	38.3	38.1
Back feather temp. °C	33.3	33.7	37.1	36.9	34.5	34.6	35.0	35.0
Caruncles temp. °C	36.2	35.9	38.0	38.0	36.2	36.2	36.8	36.7
Respiration rate/minute	68	48	174	89	53	59	98	65

TABLE 2. Test of significance (F value) of the sex difference in Turkeys

Items	F Value		
	Diurnal	Sex	Weeks
Body temperature °C	0.029	3.72*	0.23
Back skin temperature °C	13.18**	2.37	2.13
Abdomen skin temperature °C	93.04**	6.95*	57.39**
Back feather temperature °C	75.23**	0.0157	27.61**
Caruncles temperature °C	36.83**	0.225	1.13
Respiration rate/minute	284.21**	12.35**	0.91

* Significant at 5 percent level.

** Highly significant at 1 percent level.

observed, at evening. The respiration rate was higher for adult birds in all day times, but the higher difference was found at noon and the least at the evening. The two ages showed diurnal variation, but it was greater in adults than in the young birds (Table 3). The analysis of variance showed that the age difference was significant in the temperatures of body, abdomen skin, back feather, caruncles and respiration rate. The difference due to the diurnal variation was significant for all items studied except that of the abdomen skin (Table 4). The higher body temperature recorded by the young birds may be due to the high basal metabolic rate per unit of weight in young birds.

The lower temperature of adults coinciding with the higher respiration rate is due to efficient evaporative cooling through the respiratory system in adult Turkeys than the young ones. It seems that the greater increase in respiratory activity of adults at noon than the young ones is a substitution to the less efficiency of physical channels of cooling, according to the less surface area per body in adults.

Breed difference in body reactions to summer temperature

The body reactions of the both imported Bronze and Beltsville Turkeys were compared with those of Black Baladi (Egyptian) Turkeys. The mean values, feather, back skin, abdomen skin and caruncles temperatures were higher in the native breed at morning and evening than in the imported breeds Bronze and Beltsville. On the contrary, the native animals showed the lowest values in their body reactions at the hot mid-day of summer. Concerning the body temperature the three breeds showed no difference at noon, while in the other day times the Bronze recorded the higher values. At morning and at noon the Bronze showed a markedly higher respiration rate, while the Black Baladi and Beltsville showed less and close values (Table 5).

TABLE 3. The mean values of body reactors in young and adult Bronze Turkeys males in summer

Items	Morning		Noon		Evening		Average	
	Young	Adult	Young	Adult	Young	Adult	Young	Adult
Air temp. °C	27.0		34.7		26.9			
Body temp. °C	41.6	40.9	41.7	41.2	41.2	40.8	41.5	41.0
Back skin temp. °C.	37.5	37.1	38.4	38.5	37.5	37.1	37.8	37.6
Abdomen skin temp. °C	38.2	37.6	39.2	39.1	38.3	37.9	38.6	38.2
Back feather temp. °C	35.0	33.9	37.3	37.3	35.5	33.9	35.9	35.0
Caruncles temp.	35.0	35.9	37.8	37.7	36.3	35.2	36.4	36.3
Respiration rate/minute	44	73	76	144	42	52	54	88

TABLE 4. Test of significance (F values) for the age difference in body reactions of Bronze turkeys.

Items	F. value		
	Diurnal	Age	Weeks
Body temperature °C	17.24**	60.68**	2.58
Back skin temperature °C	16.62**	1.21	6.48*
Abdomen skin temperature °C	24.33**	6.47*	8.19**
Back feather temperature °C	39.66**	9.85*	10.932**
Caruncles temperature °C	175.0**	18.0**	64.7**
Respiration rate/min	38.30**	32.62**	2.33

* Significant at 5% level.

** Highly significant at 1% level.

These results give evidence that the native "Baladi" breed is capable of facing wider range of increase in air temperature with the least variation in the values of most body reactions than both Bronze and Beltsville. On the other hand, the Beltsville showed better resistance to high temperature than Bronze.

TABLE 5: The mean value of heat regulating reactions of three breeds of Turkeys males during summer

Items	Morning			Noon			Evening			Average		
	Br	BB	Bl	Br	BB	Bl	Br	BB	Bl	Br	BB	Bl
Air temp. °C.	28.7	—	—	35.1	—	—	30.9	—	—	—	—	—
Body temp. °C.	41.0	41.0	40.9	41.2	41.2	41.2	40.9	40.7	40.8	41.0	40.9	40.9
Back skin temp. °C.	37.0	37.6	36.8	38.8	38.3	38.4	37.3	38.2	37.2	37.7	38.0	37.8
Abdomen skin temp. °C	37.5	38.5	37.4	39.3	38.8	38.8	38.2	38.9	38.0	38.3	37.8	38.1
Back feather temp. °C .	34.0	34.9	33.7	37.0	36.8	37.1	34.6	36.3	34.2	35.2	36.0	35.0
Caruncles temp. °C	35.8	36.5	35.5	38.0	37.5	37.8	35.5	36.9	35.3	36.4	36.9	36.2
Respiration rate/min	80	57	56	158	129	125	65	70	44	101	85	75

N.B. Br. = Bronze.
 BB = Black Baladi.
 Bl. = White Beltsville.

References

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تأثير كل من الجنس والعمر والنوع على ظواهر التحمل الحرارى فى الجو الحار

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تم استخراج عشر ذكور وعشيرة اناث من البلتسفيل ولقد ظهر أن درجة حرارة الجسم كانت أعلى فى الاناث عنها فى الذكور خلال أشهر الصيف الحارة (يونية ويوليو) • وكان العكس صحيحا بالنسبة لباقي الظواهر حيث سجلت الذكور قيما أعلى وقد يعزى هذا الى الوزن الأصغر فى الاناث مع زيادة مساحة سطح الجسم •

أما تأثير العمر فقد تمت دراسته على البرونز فسجلت الطيور الصغيرة قيما أعلى لجميع ظواهر التحمل الحرارى عن الطيور البالغة فيما عدا سرعة التنفس التى أعطت نتيجة عكسية وكان أعلى فرق ناتج عن تأثير العمر فى الريش ، وقد قلت الفروق فى قيمة الظواهر الحرارية للممرين الى درجة كبيرة وقت الظهر فيما عدا سرعة التنفس التى أصبح الفرق فيها أكبر ، ولقد أظهرت الطيور البالغة مدى أوسع فى التغير اليومى عن الطيور الصغيرة •

أما بالنسبة للنوع فقد عقدت مقارنة بين كل من البرونز والبلتسفيل وبين البلدى الاسود وهو يمثل الرومى المحلى فى فترة الصيف • فوجد أنه على الرغم من أن الانواع الثلاثة أظهرت عدم اختلاف فى درجة حرارة الجسم عند ارتفاع الحرارة ظهرا فان قيم باقى ظواهر التحمل الحرارى كانت أقل فى البلدى عنها فى البرونز والبلتسفيل وهذا يشير الى مقدرة الرومى البلدى على مواجهة مدى أوسع فى زيادة حرارة الجو نتيجة لأقلمته على الجو الحار - ولقد أظهرت مقارنة النوعين المستودين أن البرونز كان أكثر حساسية لارتفاع الحرارة بينما كان البلتسفيل أحسن منه مقاومة •