INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 13, No. 5, p. 409-416, 2018

RESEARCH PAPER OPEN ACCESS

Effect of strain on some semen traits for local Iraqi turkey males

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Key words: Turkey, Strain, Semen, Bird, Crude protein.

http://dx.doi.org/10.12692/ijb/13.5.409-416 Article published on November 28, 2018

Abstract

This study has been conducted at the poultry farm for department of Allatefya Researches, Agricultural researches directorate, ministry of sciences and technology, during the period from 20/6/2017 to 28/10/2017. The aim of this study was to investigate the effect of strain on some semen traits for local Iraqi turkey males. A total of 36 local Iraqi turkey males in 32weeks old were used in this study. The turkey males were randomly distributed on four treatments groups, each group consisted of 9 birds depend on strain. Birds were fed during the whole period on diet contain 18 % crude protein and 2950 Kcal metabolic energy / kg. The birds were reared in ground cages (pens) during the experiment period. Semen was collected after ganders were trained for two weeks to give semen before the collection began the semen collection by using abdominal massage procedure. Results revealed that strain resulted insignificant affected regarding semen traits like ejaculate volume, Individual motility, mass motility, sperm concentrations, percentage of dead spermatozoa, and spermatocrit. While deformation spermatozoa ratio had not significant affects recorded from strain on these traits.

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Introduction

Shortage of animal protein is one of nutritional problems in the third world countries. One of the solutions to these problems is developed poultry industry and flow untraditional ways to increase animal protein especially poultry protein, one of the effective methods is verity of producing poultry protein sources (Aletor *et al.*, 2000). Chickens are classify as the most important proteins sources, whereas the other poultry species did not find the same interesting like turkeys, geese, guinea fowl, ducks, quails, ostriches and pigeons (Li and Hsieh, 2004). Turkey have raised for centuries from north and south America and most of European countries (Kotowska *et al.*, 2005). In the third world countries turkey have not enough interesting and is still raised from single farmers, there is no specific companies to develop this industry, Many different varieties of turkeys have been developed for productivity, the American Poultry Association (APA) determined eight varieties of turkeys, they are Bronze, Black, White Holland, Narragansett, Slate, Beltsville Small White, Bourbon Red and Royal Palm (Frank *et al.*, 2007). The aim of this study was to comparative semen traits among four different strains of Iraqi local Turkey males to select the best.

Materials and methods

This study has been conducted at poultry farm of Alatefya Researches department/ Agricultural researches directorate/Ministry of sciences and technology, during the period from 20/6/2017 to 28/10/2017.This experiment included a total of 36 local Iraqi turkey males in 32weeks olds. The turkey males were randomly distributed in to four treatments groups, each group contained of 9 birds depend on strain. Each treatment constituted from3replicates. All birds housed under same environmental conditions. Feed and water were available for all the period (ad libitum). Birds were fed during the whole period on diet contain 18% crude protein and 2950 Kcal metabolic energy / kg. The flock was reared in a ground cages (pens) during the experiment period. Semen were collected after ganders were trained for two weeks to give semen before the collection began, semen collection by using abdominal massage procedure(Al-Daraji *et al.*, 2012).

Treatments groups were as following:

Treatment 1(T1): semen collected from red turkey strain.

Treatment 2(T2): semen collected from bronze turkey strain.

Treatment 3(T3): semen collected from white turkey strain.

Treatment 4(T4): semen collected from black turkey strain.

Traits measured

Ejaculate Volume: semen samples were immediately evaluated for volume (ml), by graduated (ml) test tube (Al-Daraji, 2007a).

Mass motility: Mass motilities of spermatozoa (%) were estimated according index of motilities, which ranges 0 - 100 (Al-Daraji, 2007b).

Individual motility: Individual motilities (%) were determined by index of motilities which ranges 0 - 100 (Al-Daraji, 2007b).

Sperm concentration: The spermatozoa concentrations were estimated by using hem cytometer chamber (Bakst and Cecil, 1993).

Percentage of dead spermatozoa: The percentage of dead spermatozoa was estimated by using the procedure which mentioned by Al-Daraji, (2007b).

Deformation spermatozoa ratio: The percentage of abnormal spermatozoa was evaluation by using the procedure which described by Al-Daraji, *et al* (2002).

Spermatocrit: The spermatozoa packed cells volume was determined by using the procedure which described by Al-Daraji, (2007b).

A completely randomized design (CRD) has been used in this study. Statistical analyses for various variables were using the SAS program (SAS Institute,

2012). Significant difference between treatments mean was determined by using Duncan's multiple range tests (Steel and Torrie, 1980).

Results

Ejaculate volume

As seen in Table 1, there is a significant effect (P≤0.05) of strain on semen ejaculate volume. Table 1, refer to T4 (black turkey strain) recorded highest values in this trait as compared with other treatments (T1, T2 and T3). On the other hand T3 (white turkey strain) achieved high significant effect compared with groups T2 (bronze turkey strain) and T1 (red turkey strain), whereas T1 recorded lowest in ejaculate volume. However, the overall means of ejaculate volume were 0.346, 0.295, 0.255and 0.203for T4, T3, T2 and T1, respectively.

Table 1. Effect of strain on ejaculate volume (ml) (Mean ± SE) for local turkey males.

Periods	Treatments				Level of significance
	T4	T3	T2	T1	
1	0.35 ±0.012^{a}	0.23 ±0.011^{b}	0.20 ±0.013^{c}	0.15 ±0.01^{d}	*
2	0.330. ±012^{a}	0.25 ±0.008^{b}	0.22 ±0.012^{c}	0.14 ±0.08^{d}	*
3	0.36 ±0.011^{a}	0.33 ±0.006^{b}	0.30 ±0.011^{c}	0.25 ±0.01^{d}	*
4	0.37 ±0.013^{a}	0.33± 0.011^{b}	0.29 ±0.014^{c}	0.24 ±0.012^{d}	*
5	0.38 ±0.018^{a}	0.35 ±0.013^{b}	0.30 ±0.012^{c}	0.25 ±0.013^{d}	*
6	0.35 ±0.01^{a}	0.32 ±0.021^{b}	0.27 ±0.016^{c}	0.22 ±0.009^{d}	*
7	0.33 ±0.003^{a}	0.28 ±0.008^{b}	0.24 ±0.011^{c}	0.20 ±0.007^{d}	*
8	0.30 ±0.012^{a}	0.25 ±0.02^{b}	0.22 ±0.012^{c}	0.18 ±0.003^{d}	*
Overall means	0.346 ±0.013^{a}	0.295 ±0.012^{b}	0.255 ±0.011^{c}	0.203 ±0.006^{d}	*

T1: red turkey strain, T2: bronze turkey strain, T3: white turkey strain, T_4: black turkey strain Means in same rows with the same superscript were not significantly different, with different superscript were significantly different.*(P≤0.05).Periods: each period presented two weeks.

Mass activity of spermatozoa

In (Table 2), the data regarding to significant effect (P≤0.05) for strain on Mass activity of spermatozoa. Table 2, refer to T4 (black turkey strain) recorded highest Mass activity as compared with other treatments (T1, T2 and T3).Also T3(white turkey strain) achieved high significant effect compared with groups T2 (bronze turkey strain) andT1(red turkey strain),whereas T1 recorded lowest value in this traits. However, the overall means of Mass activity was 80.00, 76.18, 73.51and 70.48for T4, T3, T2 and T1, respectively.

Table 2. Effect of strain on Mass activity of spermatozoa (%) (Mean ± SE) for local turkey males.

Periods	Treatments				Level of significance
	T4	T3	T2	T1	
1	75 ± 1.3^{a}	73 ± 1.24^{b}	71 ±1.33^{c}	68 ±0.80^{d}	
2	82 ±1.11^{a}	77 ±1.23^{b}	75 ±0.73^{c}	71 ±1.10^{d}	*

3	85 ±1.21[a]	82 ±1.22[b]	80 ±0.87[c]	75 ±1.23[d]	*
4	82 ±0.81[a]	79 ±1.13[b]	75 ±0.24[c]	72 ±1.12[d]	*
5	82 ±2.2[a]	80 ±1.14[b]	77 ±1.26[c]	74 ±0.98[d]	*
6	78 ±0.65[a]	74 ±0.65[b]	71 ±1.17[c]	68 ±1.1[d]	*
7	78 ±1.31[a]	73 ± 0.83[b]	70 ±1.02[c]	66 ±1.21[d]	*
8	75 ±1.22[a]	70 ±1.22[b]	68 ±1.22[c]	65 ±0.65[d]	*
Overall means	80.00 ±0.78[a]	76.18 ±0.68[b]	73.51 ±0.63[c]	70.48 ±0.67[d]	*

T1: red turkey strain, T2: bronze turkey strain, T3: white turkey strain, T_4: black turkey strain Means in same rowswith different superscript were significantly different.*(P≤0.05). Periods: each period presented two weeks.

Individual motility of spermatozoa

Results in Table 3 revealed that treatments T4 (black strain), T3 whit strain) and T2 (bronze strain) resulted in significant (P≤0.05) increase in the percentage of individual motility of spermatozoa as compared with T1 (red strain) during the all experimental period.

It is clear that T_4 had higher individual motility of spermatozoa; also T3 had achieved high significant effect compared with T2and T1 during the all experimental periods, while the T1had lowest individual motility of spermatozoa during the all experimental periods. Similarly, the overall means of spermatozoa individual motility (%) were higher in the experimental treatments (T4, T3 and T2) (82.86, 79.23and 76.72, respectively) than that in the T1 (72.36) (Table 3).

Table 3. Effect of strain on individual motility of spermatozoa (%) (Mean ± SE) for local turkey males.

Periods	Treatments				Level of significance
	T4	T3	T2	T1	
1	80 ±1.16[a]	78 ±0.89[b]	78 ±1.11[b] B	75 ±0.77[c]	*
2	86 ±0.97[a]	82 ±1.21[b]	80 ±1.13[b]	77 ±1.1[c]	*
3	90 ±0.91[a]	87 ±1.12[b]	84 ±1.13[c]	77 ±0.22[d]	*
4	86 ±1.12[a]	83 ±1.18[b]	80 ±1.11[c]	73 ±0.87[d]	*
5	84 ±1.05[a]	80 ±0.77[b]	78 ±0.91[c]	70 ±0.16[d]	*
6	78 ±0.82[a]	75 ±1.45[b]	73 ±1.14[c]	68 ±0.72[d]	*
7	78 ±1.13[a]	73 ±1.23[b]	70 ±1.11[c]	68 ±0.17[d]	*
8	75 ±1.18[a]	70 ±1.13[b]	68 ±1.18[c]	65 ±0.21[d]	*
Overall means	82.86± 0.83[a]	79.23 ±0.93[b]	76.72 ±0.84[c]	72.36 ±0.78[d]	*

T1: red turkey strain, T2: bronze turkey strain, T3: white turkey strain, T_4: black turkey strain Means in same rows with different superscript were significantly different.*(P≤0.05). Periods: each period presented two weeks.

Table 1. Effect of strain on spermatozoa concentration (x 10^9/ml) (Mean ± Se) for local turkey males.

Periods	Treatments				Level of significance
	T4	T3	T2	T1	
1	8.9 ±0.025[a]	8.6 ±0.060[b]	8.3 ±0.113[c]	8.1 ±0.012[d]	*
2	9.4 ±0.022[a]	9.0 ±0.111[b]	8.8 ±0.072[c]	8.5 ±0.22[d] D	*
3	9.8 ±0.124[a]	9.5 ±0.132[b]	9.2 ±0.171[c]	8.6 ±0.12[d]	*
4	9.9 ±0.038[a]	9.4 ±0.116[b]	9.2 ±0.052[c]	8.6 ±0.08[d]	*
5	9.5 ±0.45[a]	9.1 ±0.070[b]	8.8 ±0.072[c]	8.4 ±0.023[d]	*
6	9.0 ±0.022[a]	8.6 ±0.128[b]	8.4 ±0.79[c]	7.98 ±0.19[d]	*
7	8.8 ±0.013[a]	8.4 ±0.036[b]	8.2 ±0.089[c]	7.98 ±0.21[d]	*
8	8.4 ±0.038[a]	8.0 ±0.211[b]	7.93 ±0.091[c]	7.85 ±0.27[d]	*
Overall means	9.212 ±0.073[a]	8.825 ±0.078[b]	8.603 ±0.072[c]	8.251 ±0.049[d]	*

T1: red turkey strain, T2: bronze turkey strain, T3: white turkey strain, T_4: black turkey strain Means in same rows, with different superscript were significantly different.*(P≤0.05). Periods: each period presented two weeks.

Spermatozoa concentration

As were given in Table 4. The parameter of spermatozoa concentration clearly refer that T4 was detected a significant difference (P≤0.05) from the others groups (T3,T2 and T1) as well as the treatment T3 had achieved a highly significant effect compared with T2and T1,while T1recorded lower sperm concentration during all experimental periods. Significant differences (P≤0.05) were observed among overall mean of treatments, the overall means of sperm concentration were higher in the experimental treatments (T4, T3 and T2) (9.212x10^9 cell ml, 8.825x10^9 cell ml and 8.603x10^9 cell ml, respectively) than that in the T1 (8.251x10^9 cell ml) (Table 4).

Spermatocritc

There were significant increases (P≤0.05) in average of spermatocrit for treatments T4, T3 and T2 compared with the T1 during the all experimental periods. However, T4 recorded the highest values of this trait during all periods and as regards the overall means of this trait as shown in (Table 5). The overall means for spermatocritc were 40.462, 36.165 and 32.003% for T4, T3, and T2, respectively as compared to T1 which was 25.50% (Table 5).

Table 5. Effect of strain on spermatocritc (%) (Mean ± SE) for local turkey males.

Periods	Treatments				Level of significance
	T4	T3	T2	T1	
1	39.30 ±0.012[a]	33.22 ±0.038[b]	27.10 ±0.021[c]	21.70 ±0.123[d]	*
2	45.80 ±0.021[a]	40.00 ±0.053[b]	36.30 ±0.028[c]	30.515 ±0.114[d]	*
3	48.60 ±0.018[a]	44.50 ±0.114[b]	40.40 ±0.022[c]	33.20 ±0.092[d]	*
4	48.80 ±0.023[a]	45.10 ±0.078[b]	44.00 ±0.120[c]	32.00 ±0.121[d]	*
5	44.10	40.70	36.80	26.80	*

	±0.031[a]	±0.111[b]	±0.103[c]	±0.115[d]	
6	37.80 ±0.011[a]	33.60 ±0.116[b]	29.20 ±0.113[c]	21.86 ±0.101[d]	*
7	33.50 ±0.028[a]	30.10 ±0.123[b]	21.86 ±0.075[c]	19.88 ±0.039[d]	*
8	25.80 ±0.046[a]	22.10 ±0.096[b]	20.65 ±0.105[c]	18.00 ±0.043[d]	*
Overall means	40.46 ±0.505[a]	36.165 ±0.501[b]	32.003 ±0.406[c]	25.50 ±0.209[d]	*

T1: red turkey strain, T2: bronze turkey strain, T3: white turkey strain, T_4: black turkey strain Means in same rows with the same superscript were not significantly different, with different superscript were significantly different.*(P≤0.05). Periods: each period presented two weeks.

Percentages of dead spermatozoa

As shown in Table 6 percentages of dead spermatozoa refer to significant decrease (P≤0.05) of the treatments (T4, T3, and T2) throughout experimental period, as compared with the (T1).

The T4 had achieved lowest percentages of dead spermatozoa. Also significant differences were found between T3 and T2 during periods of the experiment, T3 was recorded low percentage of dead sperm. While the T1 treatment had recorded highest percentage of dead sperm.

The overall means were 11.94, 12.93,14.73and 20.66% for the treatments T4, T3, T2 and T1, respectively in the percentage of dead sperm and that clearly refer to T4 treatment had lowest mean and then the mean of T3 and then the mean of T2, while the mean of T1 had recorded the highest percentage of dead sperm.

Table 6. Effect of strain on Percentages of dead spermatozoa (%)(Mean ± SE) for local turkey males.

Periods	Treatments				level of significance
	T4	T3	T2	T1	
1	11.25 ±0.21[d]	12.29 ±0.27[c]	16.65 ±0.39[b]	19.12 ±1.10[a]	*
2	10.00 ±0.28[d]	11.22 ±0.22[c]	13.88 ±0.42[b]	18.90 ±0.67[a] A	*
3	10.30 ±0.32[d]	11.00 ±0.36[c]	13.50 ±1.33[b]	20.25 ±0.21[a] A	*
4	12.34 ±0.27[d]	13.35 ±0.21[c]	14.25 ±1.22[b]	20.30 ±0.27[a] A	*
5	12.55 ±0.18[d]	13.80 ±0.73[c]	14.80 ±0.44[b]	20.50 ±1.10[a]	*
6	13.80 ±0.13 [d]	13.90 ±0.27[c]	15.10 ±0.91[b] B	22.30 ±0.15[a]	*
7	14.00 ±0.26[d]	14.55 ±0.35[c]	15.80 ±0.21[b]	22.90 ±0.65[a]	*
8	14.20 ±0.23[d]	15.00 ±0.21[c]	15.75 ±0.23[b]	23.00 ±0.28[a]	*
Overall means	11.94 ±0.39[d]	12.93 ±0.36[c]	14.73 ±0.93[b]	20.66 ±0.85[a]	*

T1: red turkey strain, T2: bronze turkey strain, T3: white turkey strain, T_4: black turkey strain Means in same rows with the different superscript were significantly different.*(P≤0.05). Periods: each period presented two weeks.

Percentages of abnormal spermatozoa

As were given in table 7. There were not significant differences among treatments T1, T2, T3 and T1 in all experimental periods in the percentages of abnormal spermatozoa. Also evaluations overall means values of the percentages of abnormal spermatozoa were not significant differences among all treatments.

Discussion

Results clearly refer to significant effected regarding semen traits like ejaculate volume, mass motility,, Individual motility, total number of sperm, spermatocrit, and percentage of dead spermatozoa were dependent on the strain of turkey.

While deformation spermatozoa ratio had not affected by strains, these results indicated that the black strain had better quantitative and qualitative semen parameters comparison with the other strains in this study. Differences in semen quantity and quality in relation to turkey strain indicated in our study were also reported by Jankowski *et al.* (2002).

Table 7. Effect of strain on abnormal spermatozoa (%)(Mean ± SE) for turkey males.

Periods	treatments				Level of significances
	T4	T3	T2	T1	
1	9.5 ±0.015[a]	9.5 ±0.113[a]	9.7 ±0.121[a]	9.5 ±0.025[a]	NS
2	10.7 ±0.027[a]	10.8 ±0.110[a]	10.7 ±0.011[a]	10.8 ±0.121[a]	NS
3	10.8 ±0.115[a]	10.9 ±0.125[a]	10.8 ±0.131[a]	11.0 ±0.117[a]	NS
4	11.5 ±0.038[a]	11.5 ±0.127[a]	11.7 ±0.133[a]	11.5 ± 0.088[a]	NS
5	12.9 ± 0.066[a]	12.9 ±0.112[a]	13.0 ±0.112[a]	13.2 ±0.012[a]	NS
6	14.5 ±0.111[a]	14.7 ±0.121[a]	14.6 ±0.231[a]	14.5 ±0.123[a]	NS
7	16.5 ±0.015[a]	16.8 ±0.019[a]	16.9 ±0.029[a]	16.8 ±0.121[a]	NS
8	15.9 ±0.121[a]	16.0 ±0.025[a]	16.0 ±0.112[a]	16.2 ±0.127[a]	NS
Overall means	12.870 ±0.218[a]	12.889 ±0.311[a]	12.925 ±0.388[a]	12.937 ±0.411[a]	NS

T1: red turkey strain, T2: bronze turkey strain, T3: white turkey strain, T_4: black turkey strain Means in same rows with the same superscript were not significantly different, NS: no significant different.Each period presented two weeks.

The red strain had characterized by the lowest semen parameters, the effect of strain in semen characteristics had been mentioned by Kotłowska *et al.* (2005). Effect of turkey strain in semen parameters may be due to genetic differences among strains for their abilities to protect sperms from negative effects of free radicals and reactive oxygen species (ROS) because the differences in their biological antioxidant systems (Thurston, *et al.*, 1993). The biological antioxidant system consist of some enzymes like Superoxide dismutase (SOD), Glutathione peroxidase (GSH-px)and catalase (CA), sperms depend on these enzymes to protect themselves from free radicals damage (Michalski, 1992).Therefore the different abilities for strains biological systems led to differences in quantitative semen parameters.

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