EFFECT OF DIFFERENT LEVELS OF COPPER SULPHATE SUPPLEMENTATION ON SOME PHYSICAL TRAITS OF RABBITS

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Abstract - Sixty four rabbits(male and female)of White New Zealand strain were used to assess the effects of supplementing copper sulphate to drinking water on performance, blood composition, organ weights and puberty. Average initial weight was ranged between 940 and 920 gm for male and female, respectively. Levels of copper sulphate were 0,20,60 and 180 ppm Cu. Final body weight, weekly body weight gain and feed conversion ratio were significantly increased($P<0.05$) by the 60 ppm Cu supplementation while 180ppm Cu significantly increased($P<0.05$) feed intake and significantly decreased($P<0.05$) water intake .Treatments had no significant effects on mortality. Final body weight and weekly body weight gain were significantly increased($P<0.05$)in male as compared with female while feed conversion ratio was not significantly different .Feed intake was significantly increased($P<0.05$) in female rather than male. Treatments had no significant effects on Hb,RBC's, WBC's and glucose while PCV % increased significantly($P<0.05$) with 60ppm Cu supplementation. Using 180ppm Cu supplement significantly increased($P<0.05$) serum urea and plasma copper levels while serumGOT significantly decreased in control as compared with the rest of Cu supplementations. Relative weights of spleen and tests were significantly increased($P<0.05$)with 180ppm Cu and 60ppm Cu supplementation, respectively. Treatments had no significant effects on either weights of kidney, liver, lung, liver, heart, brain, pituitary, adrenal and dressing percent or copper content of kidney. Treatments had no significant effects on age at puberty while 60 ppm Cu supplementation increased significantly($P<0.05$) the weight at puberty. Age and weight at puberty were significantly increased ($P<0.05$)in male as compared with female. Interaction between treatment and sex was found to be significant($P<0.05$)in age and not significant in weight at puberty. Supplementation of drinking water with copper sulphate had significant effects ($P<0.05$) on semen characterestics. Highest values of ejaculate volume and sperm concentration were recorded with 60 ppm Cu while the lowest ones of methelyne blue reduction time ,abnormal and dead sperms percentages were recorded with 180 ppm Cu supplementation. Results indicate that drinking water supplemented with copper sulphate improved the rabbit performance.

INTRODUCTION

The phenomenon of chewing on copper rings in a pen by pigs, observed by BRAUDE (1948) led to trials with copper sulphate as feed additive over the next four decades. The sulphate salt of copper is the most common source in feeds for growth promotion (CROMWELL *et al.*, 1989).Copper sulphate has been recognized as a growth promoting substance for pigs (OMOLE, 1980) and as an anthelmintic (CLARKE *et al.*, 1981). However, some reports have been contradictory in regard to effect of copper on performance. HARRIS *et al.* (1984) reported that 0.1% copper sulphate supplement of the diet had no effect on average daily gain or mortality rate of rabbits. Also, BASSUNY (1991) found that the carcass yield of rabbits was not affected by copper supplementation. Conflicting with these results, KING (1975)cleared that rabbits given copper sulphate grew faster and showed better feed efficiency than their controls, but without difference in carcass yield. Tremendous copper (4-100mg Cu /kg feed) was found to increase growth, feed efficiency and carcass yield and diminish the occurrence of diarrhea in rabbits (LIANG *et al.*, 1988). PATTON *et al.* (1982) reported a highly significant response to 400 ppm copper in diets of rabbits ,in terms of reduced mortality rate resulting from diarrhea. Also, GROBNER *et al.* (1986) concluded that, mortality was not significantly affected by either copper or oxytetracycline supplementations.

The aim of the present study was to investigate the efficacy of supplementing different levels of copper sulphate to drinking water on growth performance, water intake, mortality rate and dress percentage. Also, blood parameters and copper content of some organs were studied. In regard to fertility semen characteristics were evaluated and conception rate of dowes was calculated.

MATERIALS AND METHODS

This study was carried out at the Poultry Research Farm, Faculty of Agriculture, Alexandria university, Alexandria , Egypt , during the period from April, 1992 to July, 1992. Thirty-two male and thirty-two female rabbits (New-Zealand White) were used in this study. All the animals were at 50-55 days of age and weighed 940 ± 31 gm and 920 ± 26 gm for males and females, respectively. Animals were randomly alloted into four treatments. Each treatment included 8 male and 8 female rabbits. Each animal was housed individually in cage 70 x 60 x 50 cm and provided with feeders and automatic drinkers. Feed and water were offered *ad libitum.*

The diet of all groups contained 19.3 % crude protein and 13.3 % crude fiber (iso caloric, iso nitrogenous). Copper sulphate $CuSO_4$-$5H_2O$ was added in water as follows : treatment (1) o ppm Cu (as control), treatment (2) 20 ppm Cu, treatment (3) 60 ppm Cu and treatment (4) 180 ppm Cu. Feed and water consumption ,body weight , mortality rate were measured individually until 18 weeks of age. Water ph was also estimated. Age and weight at puberty in both sexes were recorded. By the end of the experiment period, 3 bucks from each treatment were randomly chosen and slaughtered for some carcass traits and blood sampling. A part of blood was heparinized (10-15 U/ml blood) and used for determing the hematological parameters while the other part was permitted to clot to obtain serum and stored at -15 ^{0}C.

Red blood cells (RBC's) and white blood cells(WBC's) were counted immediately after slaughtering. Packed cell volume was determined using hematocrit tubes. Haemoglobin (Hb) values were estimated by the cyanomethemoglobin method (EILERS, 1967). Blood glucose was estimated as described by (HYUARIMER and NIKKILA, 1962). Blood serum proteins were measured by the biuret as described by (ARMSTRONG and CARR, 1964), urea according to (PATTON and CROUCH, 1977). Glutamic-pyruvic transaminase (GPT) and glutamic-oxaloacetic transaminase (GOT) enzymes were assayed by the method of (RAITMAN and FRANKAL, 1957). Plasma concentrations of copper and iron were analyzed according to A.O.A.C. (1970), using the atomic absorption spectrophotometer .

After slaughter, the carcass dressing and some organs were weighed. Copper concentration was determined in weighed samples of liver, kidney, bone and muscle from the fore limb, according to A.O.A.C.(1970). Semen was artificially collected three times, once every two weeks, from all the remainder bucks, after copper treatments withdrawal. Sperm concentration and assessment of live, dead and abnormal spermatozoa were performed.

In regard of does fertility, successful pregnancies and litter size were determined. The collected data were analysed by the analysis of variance (ANOVA) technique of SNEDECOR and COCHRAN (1969). Significant difference of means were tested using least significant difference (LSD) method.

RESULTS AND DISCUSSION

Copper supplementation increased significantly ($p< 0.05$) final body wt. and weekly body wt. gain (Table 1). The maximum B.wt. 2.4 kg was achieved with the 60 ppm Cu supplement compared to the lowest value 2.09 kg with the control. Average final body weight of males (2.31 kg) differed significantly ($p<0.05$) from that of the females (2.17 kg) .The 60 Cu treatment achieved significantly ($p<0.05$) the maximum improvement of average weekly gain (0.15 kg). Average weekly gain was significantly increased ($p<0.05$) in males (0.14 kg) than females (0.125 kg). These results coincide with PATTON *et al.* (1982) who reported that rabbit growth was highly significantly affected by 400 ppm dietry copper. Also, LIANG *et al.* (1988) and BASSUNY (1991) reported that rabbit growth was improved as a consequence of copper supplement. This improvement, may be due to the ability of copper to promote growth. Conflicting with that, KING (1975) found no increase in growth rate when 200 ppm copper was added to the diet.

In regard of sex differences, reports were conflicted. EL-BANDARY (1961) working on Buscat rabbits found heavier weight for males either at four weeks or at marketing age (four months) recorded than for females. Also, MOSTAGEER *et al.* (1970) showed sex differences in body weight for Giza white rabbits but of small magnitude. Our findings agree with their results. The average final body weight of males (2.31 kg) was significantly ($p<0.05$) higher than females (2.17 kg). On the contrary, KHALIL (1980) reported that females of different breeds were generally heavier than males, but without significant difference.

Feed conversion ratio was significantly different ($p<0.05$) among treatments. The best ratio (3.6) was achieved by the 60 ppm Cu supplement. This ratio was affected significantly ($p<0.05$) by sex which was (3.65) and (4.32) for males and females, respectively.

The improvement of feed : gain ratio herein , coincides with the results obtained by LIANG *et al.* (1988) and BASSUNY (1991) on rabbits.

The absence of significant effect of copper sulphate on feed intake conflicted with the results of DOVE and HAYDON (1991) on swine and BASSUNY (1991) on rabbits, who reported significant increase in feed intake with supplemented diet copper. This confliction may be due to the difference of the treatment route, where, copper was supplemented to drinking water in our study.

Table 1 : Performance traits of rabbits (males and females) as influenced by various levels of copper sulphate supplement (mean±sd)

		Treatment (ppm Cu)				
Traits	Sex	Control	20	60	180	Average
No.of animals	M	8	8	8	8	
	F	8	8	8	8	
Initial B.Wt. (kg.)	M	0.93±0.21	0.95±0.38	0.95±0.31	0.92±0.38	0.94±0.31
	F	0.93±0.25	0.91±0.22	0.94±0.3	0.92±0.29	0.92±0.31
	Av.	0.93±0.22	0.93±0.35	0.94±0.34	0.92±0.39	0.93±0.28
Final B.Wt. (kg.)	M	2.2±0.11	2.31±0.14	2.42±0.22	2.34±0.27	2.31±0.20^{A}
	F	1.98±0.24	2.14±0.2	2.37±0.10	2.20±0.35	2.17±0.26^{B}
	Av.	2.09±0.21^{c}	2.22±0.18^{bc}	2.4±0.16^{a}	2.27±0.31^{ab}	2.25±0.24
Weekly feed intake kg/kgB.Wt.	M	0.49±0.18	0.49±0.23	0.51±0.18	0.51±0.21	0.50±0.20^{B}
	F	0.52±0.22	0.52±0.21	0.53±0.21	0.59±0.20	0.54±0.20^{A}
	Av.	0.51±0.25	0.51±0.24	0.52±0.22	0.55±0.22	0.52±0.21
Weekly gain (kg.)	M	0.13±0.06	0.13±0.07	0.15±0.08	0.14±0.06	0.14±0.06^{A}
	F	0.11±0.06	0.12±0.06	0.14±0.08	0.13±0.06	0.125±0.06^{B}
	Av.	0.12±0.08^{b}	0.13±0.07^{b}	0.15±0.07^{a}	0.14±0.07^{ab}	0.13±0.06
Feed conversion ratio (Intake: Gain)	M	6.4±1.5	6.1±1.5	6.0±1.6	6.0±1.6	6.1±1.6
	F	6.5±1.1	6.4±1.4	5.8±1.3	6.3±1.2	6.2±1.3
	Av.	6.4±1.3^{a}	6.3±1.5^{a}	5.9±1.4^{b}	6.2±1.4^{a}	6.2±1.4
PH of drinking water		7.5	7.3	6.6	6.0	....
Weekly water consumption	M	2.2±0.8	1.9±0.6	1.5±0.4	1.3±0.3	1.7±0.60
(liter/kgB.Wt.)	F	1.9±0.6	1.8±0.5	1.4±0.40	1.10±0.30	1.60±0.50
	Av.	2.00±0.80^{a}	1.9±0.60^{b}	1.5±0.50^{c}	1.2±0.30^{d}	1.7±0.60
Mortality%	M	25	....	....	....	....
	F	25	25	....	....	....
	Av.	25	12.5	....	....	....

a,b,c&d within rows means with different superscript letters differ significantly(P<0..05).
A&B within rows means with different superscript letters differ significantly(P<0.05).

Also, Table 1 shows that using different levels of copper affect significantly ($p<0.05$) the water intake (litters/kg B.wt.) with an inverse relationship. The lowest and the highest weekly water intake (1.2) and (2.0) was achieved with (180 ppm Cu) and the control (fresh water), respectively. Difference in water intake may be due to the difference in pH of drinking water. It was, 7.5, 7.3, 6.6 and 6 for control, 20 , 60,180 ppm Cu. Increasing copper sulphate supplement in water, decrease the pH value and water become more acidic due to sulfer ions and more unpalatable. To our knowledge, no information is available on the effect of copper sulphate supplementation on water consumption by rabbits.

Also, our results revealed a decrease in mortality % in treated groups compared with control. Death of rabbits wasn't observed in the 60 ppm Cu or the 180 ppm Cu treatment, inspite of absence of antibiotic supply. This result agrees with the findings of PATTON *et al.* (1982), and BASSUNY (1991), who stated that adding copper sulphate reduced mortality. On the other hand, GROBNER *et al.* (1986) stated that mortality was not significantly differed by dietary copper or oxytetracyline. The beneficial effect of copper sulphate, may be due to its protective effects against enteritis. Enteritis is known to be a major problem in commercial rabbit production.

Analysis of blood and serum are summarized in Table 2. Results indicated no significant increase in the values of blood Hb, RBC's, WBC's, glucose, total protein, GPT and ferrous owing to treatments, while PCV %, serum urea, GOT and plasma copper were significantly ($P< 0.05$) increased by copper supplementation. The 60 ppm Cu treatment achieved significantly ($P< 0.05$) the highest value (50.7%) of PCV compared to the lowest one (45%) with control. Comparable results were also reported by KORTE and PROHASKA (1987), JOHNSON and KRAMER (1987), DOVE and HAYDEN (1991) and BASSUNY (1991). The 180 ppm Cu supplement achieved the highest value of urea 33.3 than control 18.3 (mg/dl). The highest value of GOT (53 Iu/L) was obtained with 60 ppm Cu supplement and the lowest value accomplished with the respective control (41.5 Iu/L). These results coincide with BASSUNY (1991). Also, MYER *et al.* (1992) noticed significant increase in GOT and GPT due to copper sulphate addition. Serum transaminase enzymes (GOT and GPT) activities used as one of the useful ways in the diagnosis and study of acute hepatic disease. Our results seemed to indicate slight liver and kidney damage due to treatments. The distinguished increases of these enzymes noticed herein, may be due to copper sulphate supplementation. Also, results obtained showed that plasma copper levels increased significantly ($p < 0.05$) as copper supplement increased in drinking water. The increment in ferrous was not significant. These results coincide with ROOF and MAHAN (1982) who reported quadratic increase in plasma copper conc. as dietary Cu levels increased, in swine. Also, JOHNSON and KRAMER (1987) working on rats and BASSUNY (1991) working on rabbits, reported that deficient copper diet had diminishing effect on serum Cu and Fe concentration. In regard to insignificant increase in plasma ferrous, it may be due to the effect of copper on ceruloplasmin which had indirect effect on ferrous utilization (SHAROYAN *et al.*, 1977).

Table 2 : Some blood picture and components (mean±sd) of sacrificed bucks as affected by different copper sulphate supplement.

Items	Treatments (ppm Cu) control	20	60	180
No of animals	3	3	3	3
In blood:				
Hb(mg/100ml)	14.8±0.5	15.2±1.7	17.4±2.1	17.2±1.2
RBC's(x10^6/ml)	4.7±0.1	4.8±0.2	5.1±0.14	5.0±0.14
WBC's(x10^3/ml)	12.9±0.64	14.6±1.24	14.7±1.02	15.3±4.13
PCV(%)	45.0±1.3^b	47.0±1.0^b	50.7±1.8^a	47.8±2.8^{ab}
Glucose(mg/100ml)	64.6±6.0	67.7±3.1	71.5±3.7	75.0±9.0
In serum:				
Total protein(g/100ml)	7.7±1.1	8.5±0.57	9.1±0.95	8.9±0.85
Urea(mg/dl)	18.3±1.1^c	19.4±0.7^c	25.3±2.0^b	33.3±2.9^a
GOT(IU/L)	41.5±4.1^b	45.8±1.4^{ab}	53.0±0.6^{ab}	46.7±2.1^{ab}
GPT (IU/L)	12.2±0.8	12.2±1.6	13.2±1.0	12.5±0.5
In plasma:				
Cu ppm	1.6±0.12^b	1.7±0.40^b	2.0±0.12^{ab}	2.3±0.1^a
Fe ppm	1.0±0.4	1.7±1.1	3.0±1.1	2.6±0.5

$^{a,b\&c}$ within rows means with different superscript litters differ significantly($p<0.05$).

Table 3 shows the effect of copper sulphate supplement on dressing %, relative weight , and copper content of some body organs. Differences in relative organ weight (g/kg B. wt.) and dressing % studied were neither pronounced nor significant except spleen and testes which exhibited significant difference ($p < 0.05$) owing to various levels of copper supplement.

Table 3 : Dressing percentage, relative weight and copper content of some body organs (mean±sd) of sacrificed bucks as affected by different copper sulphate supplement

Items	Treatments (ppm Cu) Control	20	60	180
No of animals	3	3	3	3
Dressing %	59.5±2.00	59.4±2.20	60.70±1.4	58.30±2.00
Relative weight (/kg B.Wt.)				
Kidney(g)	6.00±0.46	7.8±1.3	6.2±0.10	7.2±0.70
Spleen(g)	0.46±0.10^b	0.56±0.05^{ab}	0.59±0.05^{ab}	0.7±0.10^a
Liver(g)	27.8±0.80	28.5±0.90	30.00±3.5	29.60±3.60
Lung(g)	4.80±0.90	5.40±0.20	4.70±0.40	4.40±0.60
Heart(g)	2.70±0.30	2.30±0.30	2.50±0.04	2.50±0.10
Brain(g)	3.60±0.12	3.7±0.30	4.30±0.60	4.00±0.80
Testes(g)	0.80±0.20b^c	0.60±0.02^c	1.70±0.22^a	1.30±0.23^b
Pituitary(mg)	10.00±0.40	10.00±0.30	9.00±0.90	8.00±2.00
Adrenal(mg)	70.00±6.00	90.00±20.00	80.00±10.00	80.00±6.00
Copper content ppm:				
Muscle	7.9±0.90^b	9.5±3.2^b	13.30±2.40^b	19.50±4.8^a
Kidney	23.00±3.10	24.00±4.50	28.3±11.70	29.80±1.70
Liver	28.00±8.7^b	29.6±2.50^b	34.60±7.70^{ab}	43.50±3.10^a
Bone	42.30±2.10^b	45.30±5.30^b	48.70±4.70^{ab}	53.30±1.30^a

$^{a,b\&c}$ within rows means with different superscript letters differ significantly($p<0.05$)

The spleen weight seems to behave in a direct proportional increase with ascending gradient concentrations of copper sulphate .The heavier weight (0.7g / kg B. wt.) was noticed in 180 ppm Cu with 52.17% increase than the control. KORTE and PROHASKA (1987) did not find significant difference of spleen and liver weight with copper supplemented and copper - deficient mice . BASSUNY (1991) found no significant effect of various levels of copper sulphate on liver and kidney weight of rabbits. YEN and POND (1993) found similar results on weight of kidney, spleen, lung and heart of pigs. STABEL *et al.* (1993) emphasized the previous results for bovine spleen and liver but significant increase was noticed in heart , with deficient copper diet. In the present study, the heavier relative weight of testes in 60 ppm Cu (1.7 g/kg B. wt.) with 112.5% increase than the control (Table 3). This suggests that Cu supplements might exert a stimulatory effect on testicular development . It was obviously shown later, the significant effect of copper sulphate on semen characteristics. It can be concluded that , not only the increase in testes weight but also the improvement in semen characteristics were the positive effect of copper sulphate supplement.

Treatments with copper sulphate significantly increased($P<0.05$) the copper content of muscle, liver and bone (Table 3).The highest values of copper content recorded with 180 ppm Cu supplementation were 19.5, 43.5 and 53.3 ppm Cu, respectively.

ROOF and MAHAN (1982) and CROMWELL *et al.* (1989) reported that liver and kidney copper increased with elevated concentration of copper supply in the diet of swine. BASSUNY (1991) found direct proportional increase in liver copper content with copper sulphate increase in rabbit diet. However, AOYAGI and BAKER (1993) found decrease in copper content of liver of chicken with coper deficient diet. Copper deficient pastures caused spontaneous bone fractures with mild degree of osteoprosis in sheep, and the copper deficiency was the causative factor in a failure of deposition of calcium in cartilage matrix (FOLLIS *et al.*, 1955). Also LEDOUX *et al.* (1991) found a trend for increases of bone of chicks with increasing dietary copper.

From all mentioned above , it is clearly that , copper supply affect copper content of these organs according to its magnitude. Finally , it is preferable to avoid copper supply before either marketing or slaughtering by at least two weeks, since no higher levels of copper are used in our study compared with high copper supply (500 ppm Cu) used by CROMWELL *et al.* (1989) who found that liver copper concentration decreased greatly within 14 days after treatment withdrawal .

Treatments had no significant effects on age at puberty (Table 4). However, significant difference ($P<0.05$) was found due to sex. It recorded 142.5 and 137.6 days for male and female, respectively. Age of males at puberty, herein, coincides with findings of ABO EL-EZZ (1977).

Table 4 : Age (days) and body weight (kg) of bucks and does at puberty and litter size (mean±sd) and conception rate (%) for does owing to different levels of copper sulphate supplement.

Treatments	Age at puberty		Average	Weight at puberty		Average	Conception rate (%)	Litter size (n)
	Buck	Does		Buck	Does		Does	Does
No.of animals	5	7		5	7		7	7
Control	149.2±3.8	137.7±1.6	143.5±6.4	2.23±0.13	1.99±0.26	2.11±0.24^{c}	42.9	6.3±1.1
20ppm Cu	142.8±8.02	137.7±1.6	140.3±5.6	2.40±0.11	2.14±0.22	2.27±0.21^{b}	57.1	7.0±0.8
60ppm Cu	138.8±8.5	137.5±1.6	138.2±5.3	2.54±0.23	2.40±0.23	2.47±0.16^{a}	71.4	7.4±1.1
180ppm Cu	139.0±3.5	137.7±1.6	138.4±3.6	2.30±0.21	2.28±0.21	2.29±0.25^{ab}	57.1	6.75±1.5
Average	142.5±7.5^{A}	137.6±1.5^{B}		2.37±0.20^{A}	2.20±0.27^{B}			

$^{a,b\&c}$ within rows means with different superscript letters differ significantly($p<0.05$).
$^{A\&B}$ within rows means with different superscript letters differ significantly ($p<0.05$).

Weight at puberty (Table 4) showed significant difference ($p< 0.05$) owing to treatment or sex. The heavier wt. (kg) accompanied the 60 ppm Cu which were 2.54 and 2.4 for male and female ,respectively. Table 5 shows that the interaction between treatment and sex was significant ($P<0.05$) on age at puberty while was not significant in weight at puberty.

Conception rate (%) attended to increase as the copper sulphate increased (Table 4). The maximum increase was 66.4 % which was recorded by the 60 ppm Cu treatment as compared with control. The litter size showed no significant difference owing to the different treatments with an average (6.9).

Semen characteristics of bucks were affected significantly ($p<0.05$) by treatment. The highest ejaculate volume (0.55 ml) and sperm concentration (5.9×10^8/ cc) obtained in the 60 ppm Cu supplement. MBRT, in general has a decreasing trend, indicating the improvement viability of spermatozoa as Cu supplement increases Abnormal sperms % was found to be 7.8% in the 180 Cu supplement with a decrease of 25.7% less than the control. Also, dead sperms (%) recorded the minimum 6.3% with the (180 ppm Cu) rather than the control (8.1%).

The improvement results obtained here owing to copper sulphate seem to be due to the hygienic status of animals and the antiseptic effect of copper sulphate. Copper therapy had improved fertility in sheep as reported by HOWELL (1968).

Table 5 : Analysis of variance of copper supplement (treatment), sex and their interaction on age and weight at puberty

S.V.	d.f.	M.S.	
		Age at puberty	Weight at puberty
Treatments(T)	3	52.5	0.27*
Sex(S)	1	273.60*	0.30*
TxS	3	66.00*	0.04
Error	40	19.65	0.05

* $P<0.05$

Table 6 : Some characteristics of semen as affected by different copper supplement (mean±sd).

	Treatments (ppm Cu)			
	Control	20	60	180
Ejaculate volume (ml)	0.41 ± 0.09^c	0.47 ± 0.09^b	0.55 ± 0.11^a	0.46 ± 0.11^b
Sperm conc. ($\times10^8$/c c)	5.2 ± 0.60^b	5.7 ± 1.0^{ab}	5.9 ± 0.90^a	5.4 ± 0.10^b
Methylene blue reduction time(min).	4.2 ± 0.50^a	4.00 ± 0.80^a	3.4 ± 0.90^b	3.6 ± 0.40^b
Abnormal sperms(%)	10.50 ± 1.10^a	9.40 ± 1.10^b	8.5 ± 1.80^c	7.8 ± 1.70^c
Dead sperms(%)	8.10 ± 1.40^a	7.80 ± 1.40^a	6.5 ± 1.9^b	6.3 ± 1.30^b

a,b&c within rows means with different superscript letters differ significantly ($p<0.05$).

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