RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

4.1. Effect of age on body weight and measurement in cow bulls:

Table (2) and figures (1-6) revealed the relation between body weight, dimensions and cow bulls age.

In general, cow bull weight and dimensions were increased with their age in different rates. The highest increase of body weight was recorded (521.6 ± 7.58 kg) for group of > 24 month of age while, the lowest (212.07 ± 6.87 kg) attained at 8-12 month of age group. While the highest increase in H.G. was recorded (176.33 ±1.39 cm) during the period of > 24 months of age and the lowest (137.00 ± 1.99 cm) was during the period 8-12 months of age. Similarly, the other studied dimensions showed an increase with advanced age of cow bull at different rates.

The analysis of variance table (3) revealed in a highly significant ($P < 0.01$) effect of age on all body dimensions studied, which disagree with the findings of **Chrenk, (1988),** who showed that different body measurements of four breed slovokian pied (sp) and Holestein Friesian (HF); (SP) crossbred and (HF inheritance) at 3-16 months of age were mostly non significant except for round circumference trait. While, agree with **Uhlor, (1989)** who said that differences between solvokian pied (sp) bulls and sp Red and white Holstein at 3-18 months of age were significantly affected on measurements of chest width, depth, circumfcrences, length and cannon bone circumference.

Table (2): Mean ±S.E. of cow bull age groups on their body weight and measurements

Age group month	No. of measurements	B.W. K.g	H.G. (cm)	B.L (cm)	F.L (cm)	P.W (cm)	D.B.T.C. (cm)
8-12	14	212.07 ± 6.87	137.00 ± 1.99	63.21 ± 1.35	39.00 ± 0.53	41.14 ± 0.41	33.71 ±0.60
13-18	47	307.04 ± 7.01	152.43 ± 0.80	78.38 ± 1.16	46.76 ± 0.44	45.34 ± 0.45	38.21 ±0.52
19-24	44	427.16 ± 6.37	165.02 ± 0.62	92.00 ± 0.788	52.93 ± 0.42	52.50 ± 0.58	45.36 ± 0.81
> 24	12	521.16 ± 7.58	176.33 ± 1.39	99.83 ± 3.02	60.33 ± 0.68	62.08 ± 1.50	50.50 ± 0.60
Grand mean	117	362.82 ± 9.19	157.77 ± 1.12	83.89 ± 1.18	49.55 ± 0.59	49.25 ± 0.64	41.62 ± 0.60

B.W : Body weight (kg) **H.G.: Heart girth (cm.)**

F.L : Femur length (cm) **P.W : Paunch width (cm)**

D.B.T.C.: Distance between tuber coxa (cm)

B.L: Back length (cm)

Table (3): Analysis of variance and F-ratios of cow bull age groups on body weight and measurements.

Traits	S.O.V	S.S.	D.F.	M.S	F
B.W.	Between G. Error	947714.3 199155.0	3 113	3159004.750 1762.433	179.244**
H.G	Between G. Error	13831.636 3101.133	3 113	4610.545 27.44	168.00**
B.L	Between G. Error	13354.425 5607.130	3 113	4451.475 49.621	89.710**
F.L	Between G. Error	3821.104 869.888	3 113	1273.701 7.698	165.456**
P.W	Between G. Error	4079.628 1422.184	3 113	1359.876 12.586	108.049**
D.B.T.C	Between G. Error	2983.542 1965.911	3 113	994.514 17.397	57.164**

Where ** = P < 0.01

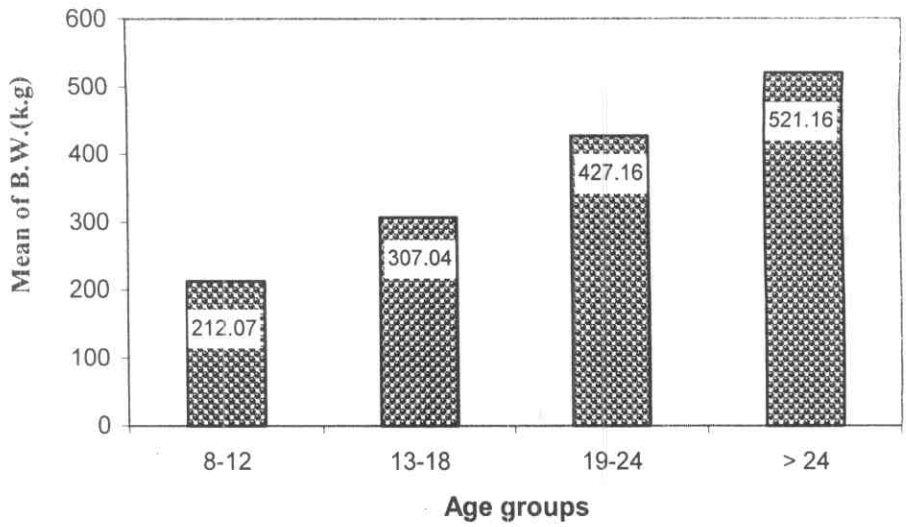
B.W : Body weight (kg) **H.G.: Heart girth (cm.)**

F.L : Femur length (cm) **P.W : Paunch width**

D.B.T.C.: Distance between tuber coxa (cm)

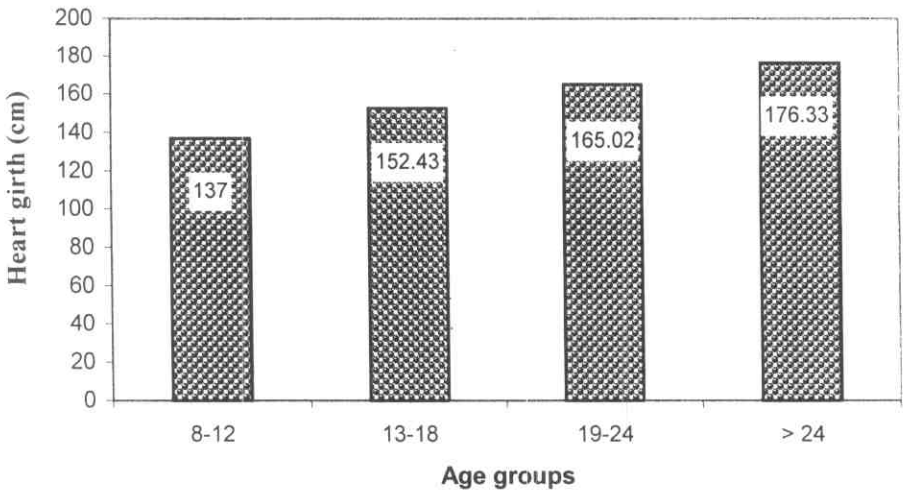
B.L : Back length (cm)

Fig. (1)



Relation between cow bull age groups and their body weights (B.W)

Fig (2)



Relation between cow bull age groups and their Heart girth (H.C) dimensions.

This was different for **Mohanty *et al.* (1991)**, that studied on 18 Holestein bulls aged (13-83) and proved that age was significantly correlated with heart girth (H.G.) only.

4.2. Effect of age on body weight and measurement in buffalo bulls:

Tables (4 and 5) and Figures (7-12) revealed that the change in body weight and dimensions were affected by change in buffalo bulls age and linearly increased with age. The highest body weight was observed (468.53 ± 11.81 kg) in > 24 months group of age while, the lowest (203.66 ± 9.05kg) was in 8-12 months group. Other studied body dimensions had a similar trend with a little increase in the > 24 months of age group.

However, variations between different buffalo bulls age groups in all studied dimensions traits were significant ($P<0.01$) (table 4). Overall means of H.G; B.L; F.L; P.W and D.B.T.C were 159.38; 112.00; 56.34; 60.66 and 52.97 (cm); respectively. In this respect, **El-Kashab, (1994)** found that overall means of Heart girth (H.G) and body length (B.L) measurements were 208 ±13.9 and 104 ± 24.6 cm, respectively in Egyptian buffalos (1.3-8.0 year of age).

4.3. Effect of cow bulls age on their reaction time and semen characters:

Tables (6 and 7) and Figuers (13-20) revealed the effect of cow bulls age on their reaction time and semen characters. Obtained results showed that bulls aged (13-18) months had the highest mean values of reaction time (16.67±2.76sec.) dropped during next age group (19-24 months) to (10.16 ± 1.20 sec.).

Table (4): Mean ± S.E of body weight and measurements of buffalo bulls.

Age group (months)	No. of measurements	B.W. K.g	H.G. C.M.	B. L. C.M.	F. L. C.M.	P. W. C.M.	D.B.T.C. C.M.
8-12	9	203.66 ±9.05	128.55 ±2.36	99.44 ±1.11	49.33 ±1.63	48.11 ±1.57	43.55 ±5.07
13-18	19	310.21 ±9.17	151.89 ±1.71	108.00 ±0.82	54.42 ±1.89	58.79 ±1.14	50.89 ±1.65
19-24	22	382.41 ±11.76	165.59 ±1.51	114.23 ±1.12	56.77 ±2.02	62.27 ±1.25	54.14 ±1.49
> 24	15	468.53 ±11.81	178.26 ±1.41	121.33 ±0.88	62.33 ±1.51	68.20 ±1.20	59.53 ±0.97
Grand mean	65	356.43 ±11.83	159.38 ±2.12	112.00 ±1.01	56.34 ±1.01	60.66 ±0.98	52.97 ±1.16

B.W : Body weight (kg) **H.G.: Heart girth (cm)**

F.L : Femur length (cm) **P.W : Paunch width (cm)**

D.B.T.C.: Distance between tuber coxa (cm)

B.L: Back length (cm)

Table (5): Analysis of variance and F- ratio value of buffalo bulls age group on body measurements.

Traits	S.O.V	S.S.	D.F.	M.S	F value
B.W.	Between	453973.7	3	151324.576	72.194**
	G. Error	127860.2	61	2096.069	
H.G	Between	15818.121	3	5271.707	111.338**
	G. Error	2888.263	61	47.349	
B.L	Between	3138.581	3	1046.194	59.787**
	G. Error	1067.419	61	17.499	
F.L	Between	1054.725	3	351.575	5.638**
	G. Error	3803.829	61	62.358	
P.W	Between	2393.743	3	797.914	29.4136**
	G. Error	1654.810	61	27.128	
D.B.T.C	Between	1555.603	3	518.534	7.919**
	G. Error	3994.336	61	65.481	

Where ** = P < 0.01

B.W : Body weight (kg)

H.G.: Heart girth (cm.)

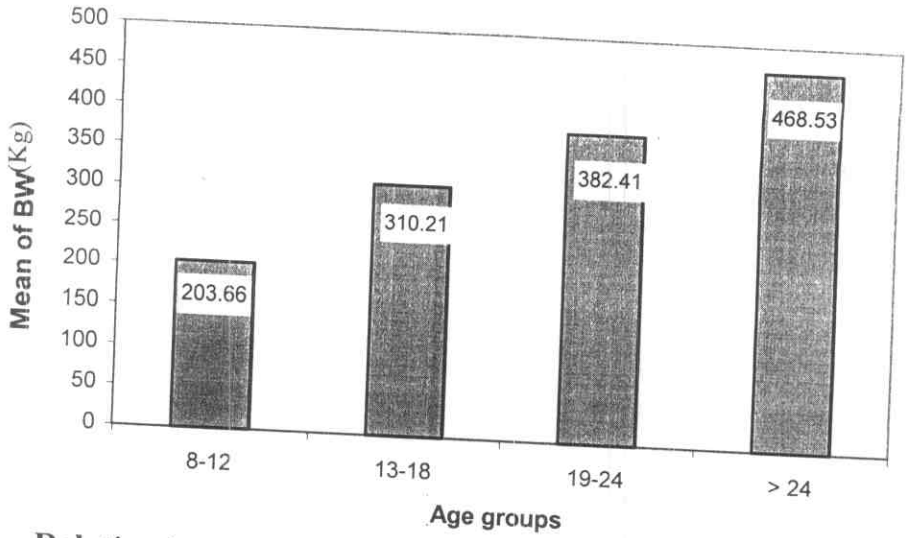
F.L : Femur length (cm)

P.W : Paunch width

D.B.T.C.: Distance between tuber coxa (cm)

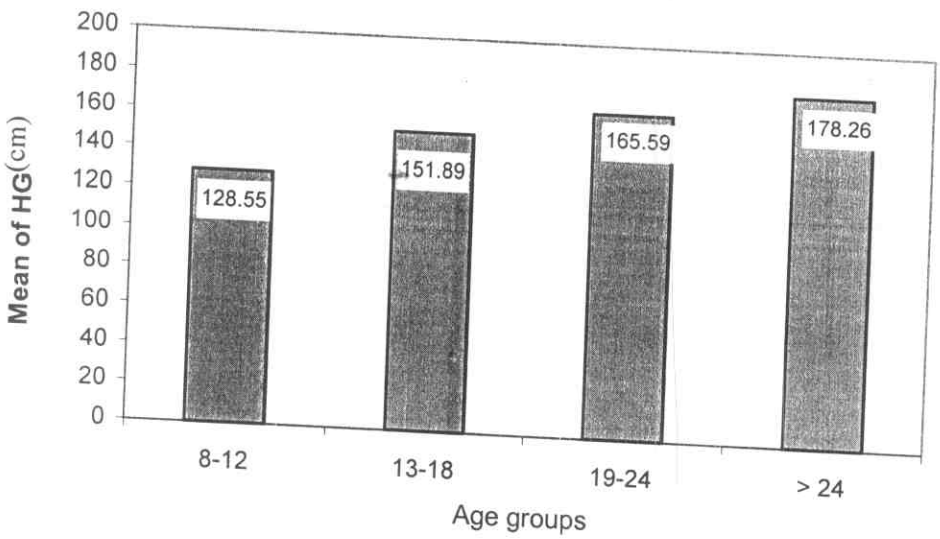
B.L: Back length (cm)

Fig. (7)



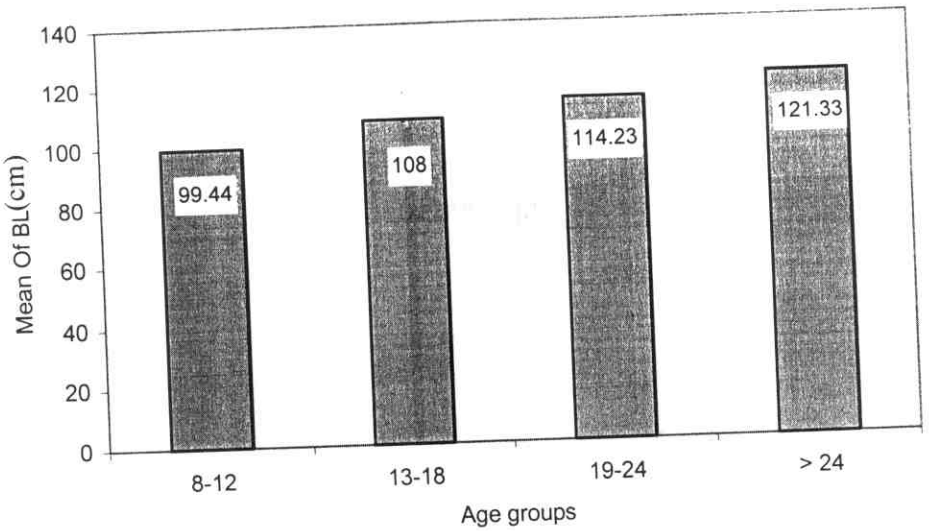
Relation between age groups and body weight in buffalo bulls (K.g)

Fig. (8)



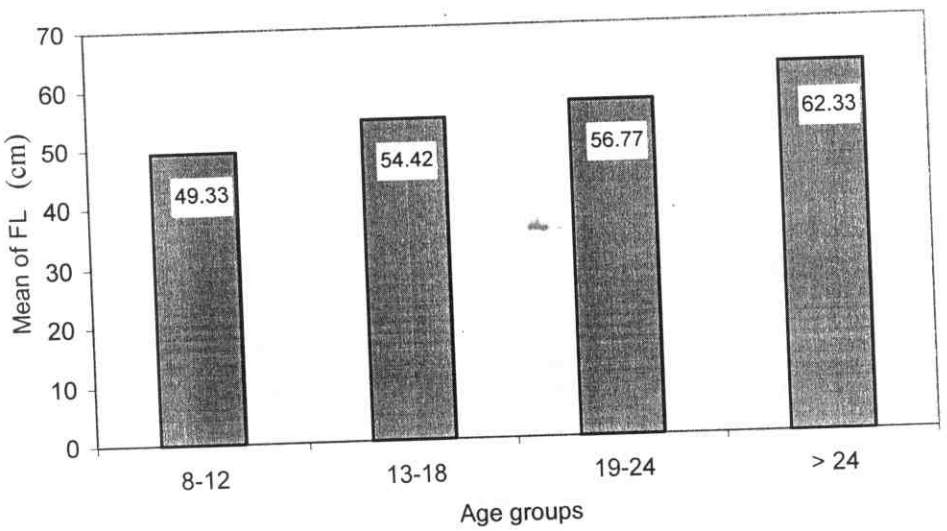
Relation between age groups and Heart girth (Cm) in bufflao bulls

Fig. (9)



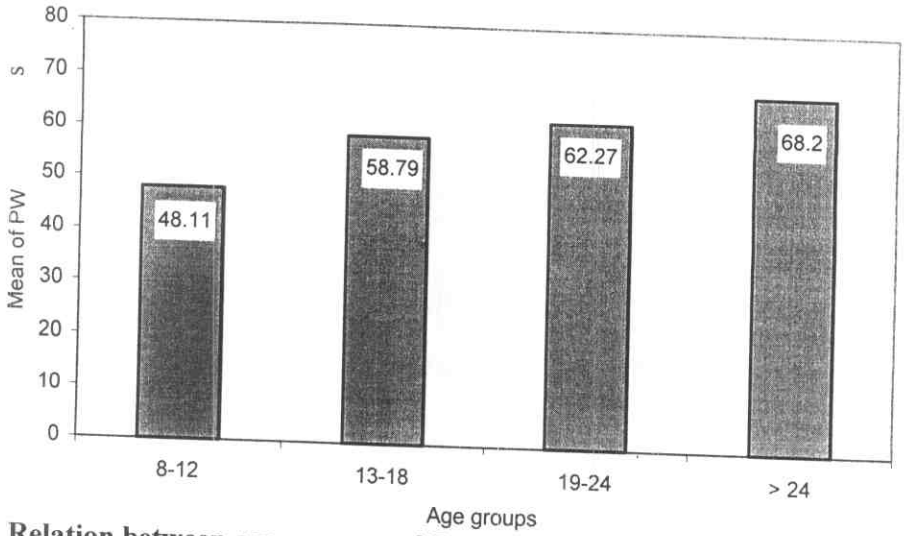
Relation between age groups and back length (cm) in buffalo bulls

Fig. (10)



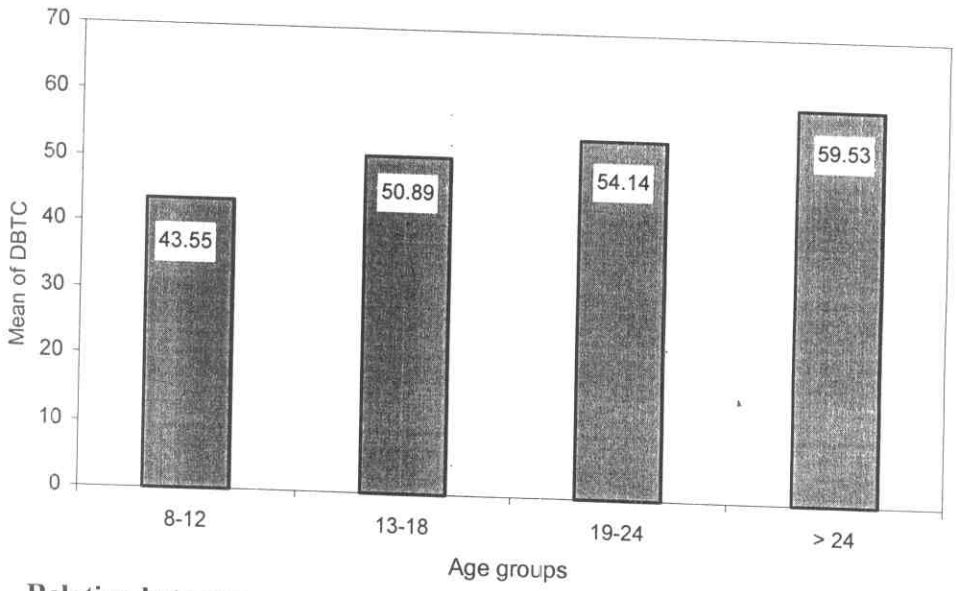
Relation between age groups and femur lengh (cm) in buafflo bulls

Fig (11)



Relation between age groups and Paunch width (cm) in buffalo bulls

Fig. (12)



Relation between age groups and distance between tuber coxa (cm) in buffalo bulls

Table (6): Effect of cow bulls age group (Mean ± S.E) for reaction time and semen characters.

Age group (months)	No. of Sample	Rt. Sec	S.V ml.	M.M (0-5)	I.M %	P.L.S %	S.C × 10^7/ml	Ma.A %	Mi.A %
13-18	9	16.67 ±2.76	3.00 ± 0.38	2.50 ±0.22	72.78 ±2.06	76.89 ±2.91	111.22 ±19.20	5.22 ±0.68	4.44 ±0.75
19-24	30	10.16 ±1.20	4.47 ± 0.31	3.31 ±0.10	80.50 ±0.81	84.77 ±0.83	132.27 ±5.10	4.23 ±0.52	4.17 ±0.47
> 24	12	15.00 ±2.30	6.33 ± 2.68	3.00 ±0.16	78.75 ±1.39	83.00 ±1.04	154.17 ±11.57	4.33 ±0.41	4.25 ±0.55
Total	51	12.41 ±1.07	4.65 ±0.66	3.09 ± 9.08 E-02	78.72 ±0.78	82.9 ±0.84	133.71 ±5.48	4.43 ±0.34	4.24 ±0.33

R.t = Reaction time (Sce.)

S.V. = Semen volume (ml.)

M.M.= Mass motility (0-5 degree)

P.L.S. = Percentage of live sperm (%)

Sc. = Sperm concentration (×10^7/ml)

I.M= Individual motility (%)

Ma.A = major Abnormality (%)

Mi.A = Minor abnormality (%).

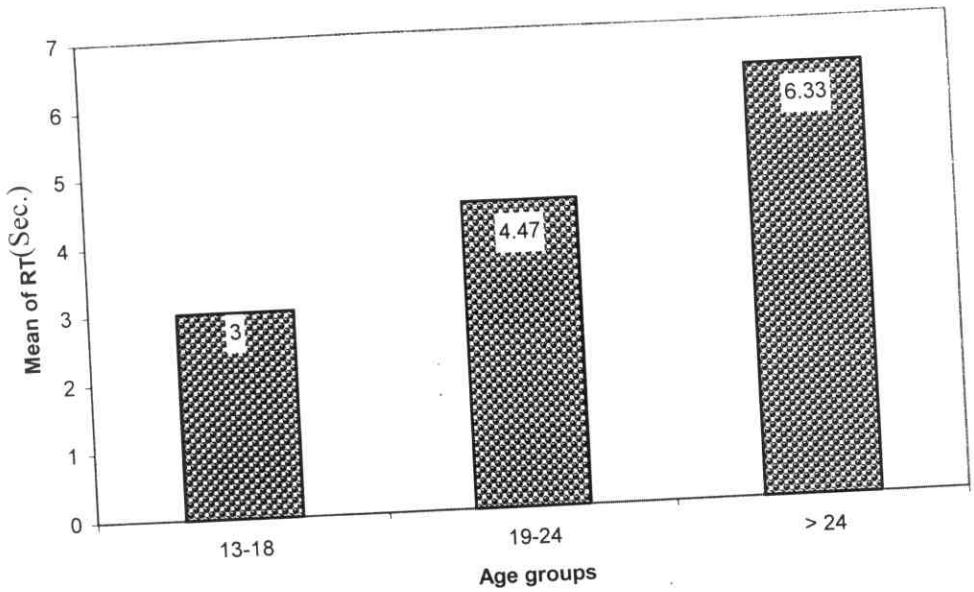
Table (7): Analysis of variance and F-ratios of cow bull age groups on reaction time and semen characteristic.

Traits	S.O.V	S.S.	D.F.	M.S	F
R.T	Between	403.653	3	134.551	2.535*
	G. Error	2494.700	47	53.079	
S.V	Between	59.514	3	19.838	0.893
	G. Error	1044.133	47	22.216	
M.M	Between	4.768	3	1.589	4.599**
	G. Error	16.242	47	0.346	
I.M	Between	412.581	3	137.617	5.727**
	G. Error	1129.306	47	24.028	
P.L.S	Between	429.66	3	143.22	4.978**
	G. Error	1352.256	47	28.771	
S.C	Between	9635.499	3	3211.833	2.256
	G. Error	66901.089	47	1423.427	
Ma. A	Between	6.921	3	2.307	0.372
	G. Error	291.589	47	6.204	
Mi. A	Between	0.538	3	0.179	0.031
	G. Error	272.639	47	5.801	

Where * = $P < 0.05$

** = $P < 0.01$

Fig (13)

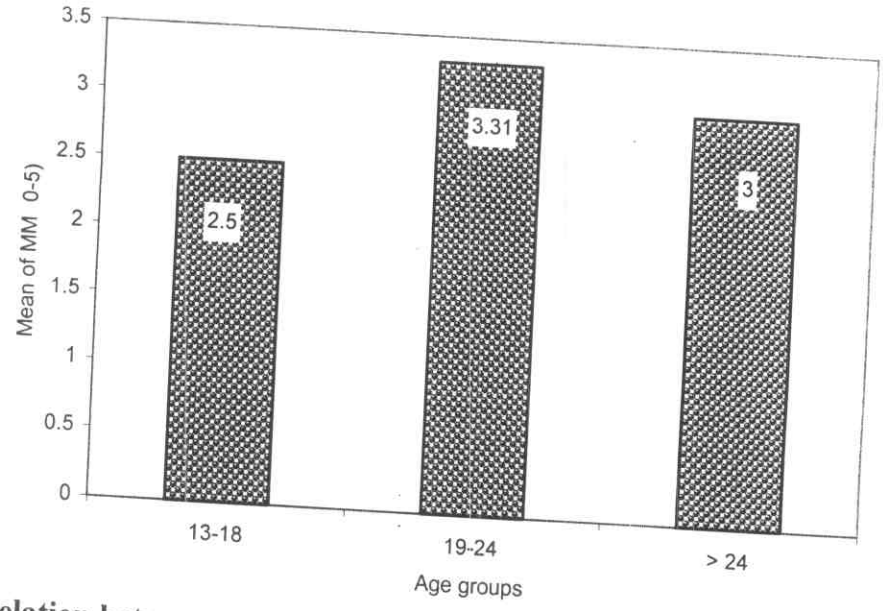


Relation between age groups and reaction time (Sec.) in cow bulls

Fig (14)

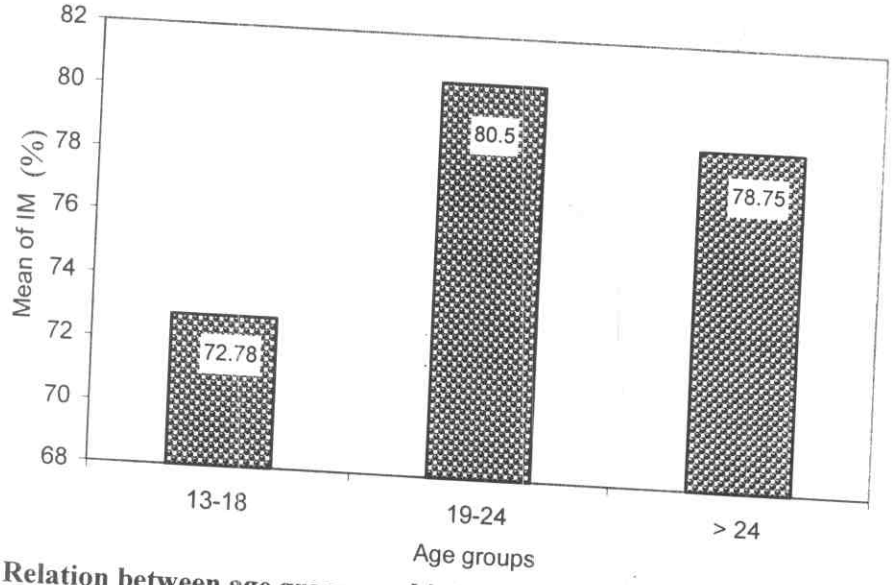
Relation between age groups and semen volume (ml) in cow bulls

Fig (15)



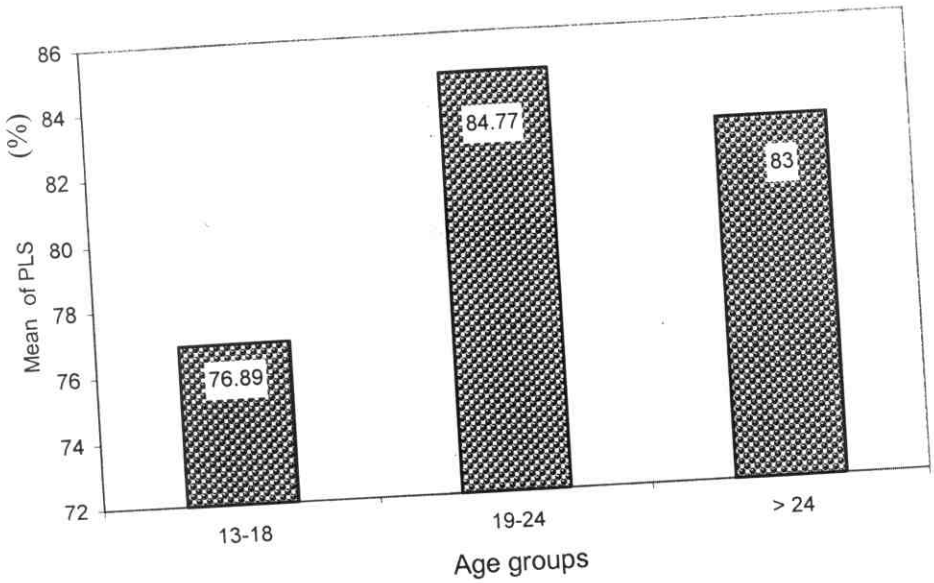
Relation between age groups and mass motility (0-5) in cow bulls

Fig (16)



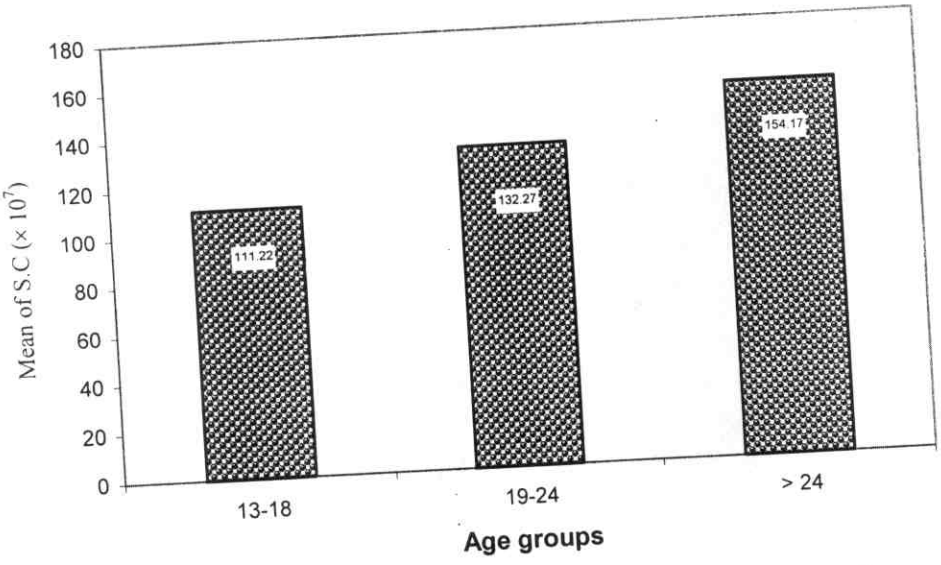
Relation between age groups and individual motility (%) in cow bulls

Fig (17)



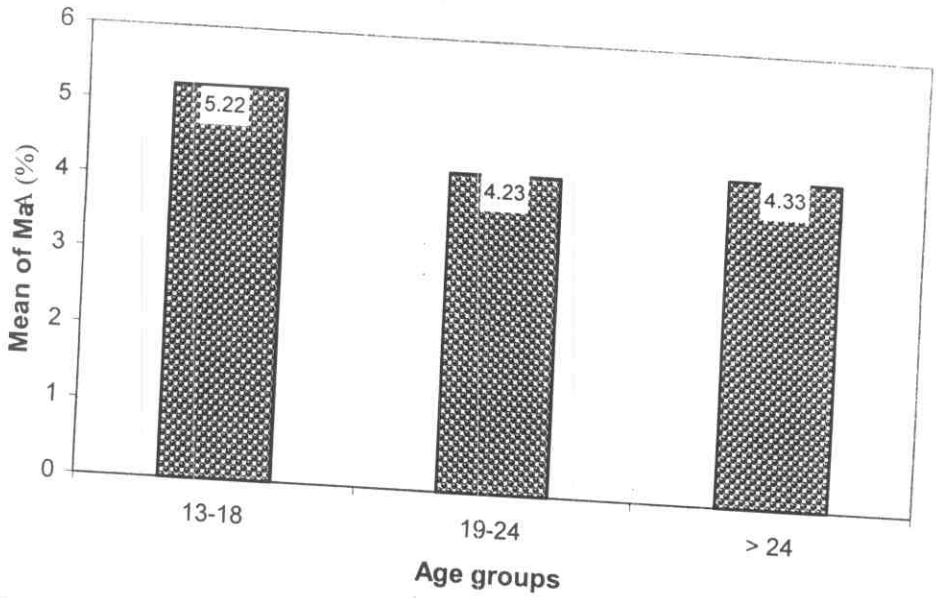
Relation between age groups and percentage of live sperm (%) in cow bulls

Fig (18)



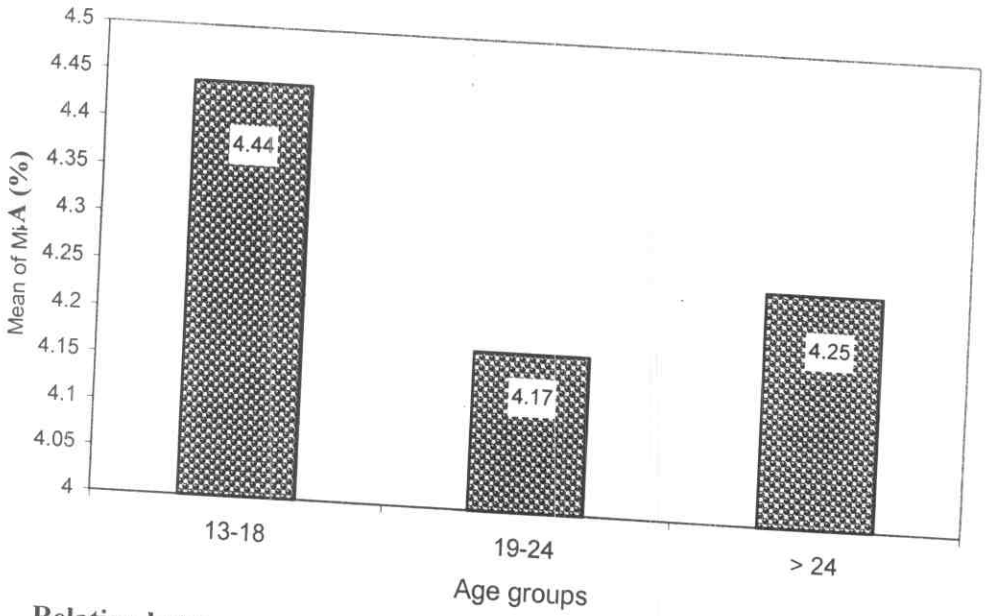
Relation between age groups and sperm concentration ($\times 10^7$/ml) in cow bulls

Fig (19)



Relation between age groups and major abnormality (%) in cow bulls

Fig (20)



Relation between age groups and minor abnormality (%) in cow bulls

Then, increased again to attained (15.00 ± 2.30 sec) at > 24 months. In general results showed an increase in all bulls in sexual desire with best results at (19-24 months) of age (10.1 ±1.2 sec.) when compared with overall mean (12.41 ±1.07 sec.) at whole experimental period.

Table (6) and Figure (14) showed differences between semen volume during the three stages of cow bull age groups. Obtained results revealed that semen volume and sperm concentration increase with the increase of cow bull age and the highest values were observed at > 24 months age group (6.33 ±2.68 ml) and (154.17 ±11.57 × 10^7/ml) and these results were logic scince bulls, attained their maturity, while the lowest value was at puberty age (13-18 months) (3.00 ±0.38 ml) and (111.22 ±19.2 × 10^7/ml) when compaired with their overall means (4.65 ±0.66ml) and (133.7 ±5.48 × 10^7/ml).

Generally, cow bulls having (19-24 months) of age recorded the highest values of mass motility (M.M), individual motility (I.M) and percentage of live sperm (P.L.S) were 3.31, 80.50 and 84.77, respectively while the lowest values of all semen characters average were observed at 13-18 months group for the previous mentioned reason.

On the other hand for sperm major and minor abnormalites best results were found to be at (19-24 months) age group (4.23 % & 4.17 %) then followed by the cow bulls aged > 24 months of age (4.33% & 4.25%) and the lowest values of average semen abnormalities was (5.22% & 4.44%) at 13-18

months age group when compaired with their overall mean of the both abnormalities was (4.43 % & 4.24%) respectively (Table6).

Analysis of variance for effect of cow age groups on their reaction time and semen characters were illustrated in (Table 7).

Results showed that cow bulls age was significantly affected with reaction time ($P<0.05$) and highly affected with mass, individual motility and percentage of live sperm ($P<0.01$) this agreed with **Mohanty *et al.* (1991)**, using 18 Holstein bulls aged 13-83 months, showed that the age was significantly affected with sperm motility and live sperm percent. And with **Tamayo *et al.* (1991)**, studied on Holstein bulls at 8-13 months of age and showed that there was a positive correlation between semen quality and with advancement of bull age. This was similar to the finding of **Rekwot *et al.*, (1988) and Rao *et al.*, (2000)** who proved that semen quality improved with age.

Gilordi *et al.*, (2001) observed that there was a significant difference ($P<0.05$) between average of sperm motility and morphological abnormalities of Nelore bull aged 18 months. They showed that most of the 18 months old Nelore bull were in puberty however, the quality of their semen was poor.

4.4. Cow bulls semen characteristics :

4.4.1. Semen volume (S.V) :

In this study the overall mean of S.V during the whole period of trial was (4.65 ±0.66 ml). This was higher than what was recorded by **Troconiz *et al.*, (1991)** (2.1 ±0.1/ml for Nellor bulls and 3.6 ±0.2 ml for Guzerat bulls), **El-Feel *et al.*, (1992)**

(2.14 /ml for Fresian bull), **Esperon and Lopez, (1993)** (3.75 /ml for Brahman bulls), **Sousa *et al.*, (1996)** (2.73 cm for young Czechpied bull), **Rao, *et al.* (2000)** (2.39 ±0.13 / ml for Ongole bulls). While our results were less than of **Pathak *et al.* (1990)** for Holstein Friesian crossbred bulls (5.5 ± 0.2 /ml).

4.4.2. Mass Motility (M.M.)

Overall mean of Mass motility during the periods of trial was (3.09±9.08E-02). The highest value recorded during the period 12-24 months was (3.31±0.10). And lowest value during the peroid 13-18 months was (2.50 ± 0.22).

4.4.3. Individual Motility (I.M) :

The study showed that overall mean of individual motility during the whole periods of trial equals (78.72 ±0.78%). This was similar to the finding of **El-Feel *et al.* (1992)** for Friesian bulls (79.30%) while higher than those obtained by **Esperon *et al.*, (1993)** in Brahaman bulls (55.54 %) and **Pathak, *et al.* (1990)** in Holestin Friesian cossbred bulls (64.7 ±1.2%).

4.4.4. Percentage of live sperms (P.L.S) :

Overall mean of PLS during the whole periods of this trial was (82.9 ±0.84%) which was higher than proved by **Pathak, *et al.* (1990)** for crossbred bulls (67.6%) and **Rao, *et al* (2000)** for Ongole bulls (74.86 ±1.65%).

4.4.5. Sperm concentration (S.C) :

The study recorded that overall mean of the sperm concentration along the experimental period was (133.71 ±5.48 ×

10^7/ml). Which was higher than what recorded by **Pathak *et al* (1990)** (844 × 10^6/ml), **Al-Varez *et al.* (1995)** (480.0 × 10^6 spematoroa /ml) of Holestein friesian bulls; **Troconiz *et al.* (1991)** (91.7 ±23.3 × 10^6/ml) of Nellore bulls and (94.8 ±13.1 × 10^6/ml) of Guzerate bulls; **Esperon and Lopez (1993)** (612.8 × 10^6/ml) of Brahman bulls and **Rao *et al.* (2000)** (497.07 ±22.37 × 10^6 spermatozoa/ml) of Ongole bulls.

4.4.6. Sperm abnormalities:

The study showed that overall mean of both abnormalities of sperm during the whole period of trial were (4.43 & 4.24%). Which was less than that recorded by **Troconiz *et al.*, (1991)** (11.1; 10.3; 8.03 and 6.7% in Guzerat at 13-15, 16-18, 19-21 and 22-24 months of age respectively), and (14.40, 12.2, 10.2 and 8.0% in Nellore bulls at the same age groups, respectively, **Esperon and Lopez (1993)** where percentage of major abnormality was (5.84%) of Brahman bulls; **Al-varez *et al.*, (1995)** in Holstein bulls at 327, 271, 314 and 338 days old, was 30.6, 22.5, 29.9 and 61.0%, respectively and **Sousa *et al.*, (1996)** who reported that abnormal spermatozoa averaged (19.14%) in young Gzech pied bulls (11-18 month).

4.5. Effect of buffalo bulls age on their reaction time and semen characters :

Average means ± SE for the effect of buffalo bulls age groups on their reaction time and semen characters as well as its analysis of variance were illustrated in tables (8 and 9) and figures from 21 to 28. Obtained data showed that reaction time was increased with the increase of bull age with lowest values at

Table (8): Mean ± S.E. of buffalo bull age groups on reaction time and semen characters.

Age group (months)	No. of samples	Rt Sec.	S.V ml	M.M (0-5)	I.M %	P.L.S. %	S.C × 10^7/ml	Ma.A %	Mi.A %
13-18	3	16.67 ±3.33	1.50 ±0.28	3.16 ±0.16	75.00 ±2.88	78.33 ±2.60	144.66 ±5.70	8.67 ±0.33	6.33 ±0.33
19-24	6	21.67 ±8.43	1.41 ±8.33 E-02	2.33 ±0.42	68.33 ±3.07	77.16 ±2.61	152.33 ±6.78	5.66 ±0.61	5.66 ±0.95
> 24	13	25.38 ±4.29	2.04 ±0.26	2.23 ±0.16	70.00 ±2.40	74.85 ±2.54	121.31 ±11.84	8.38 ±0.94	7.23 ±0.95
Total	22	23.18 ±3.38	1.79 ±0.17	2.39 ±0.16	70.22 ±1.69	75.95 ±0.67	132.95 ±7.76	7.68 ±0.63	6.68 ± 0.63

R.t = Reaction time (Sec.) **S.V. = Semen volume (ml.)**

M.M.= Mass motility (0-5 degree) **P.L.S.=Percentage of live sperm (%)**

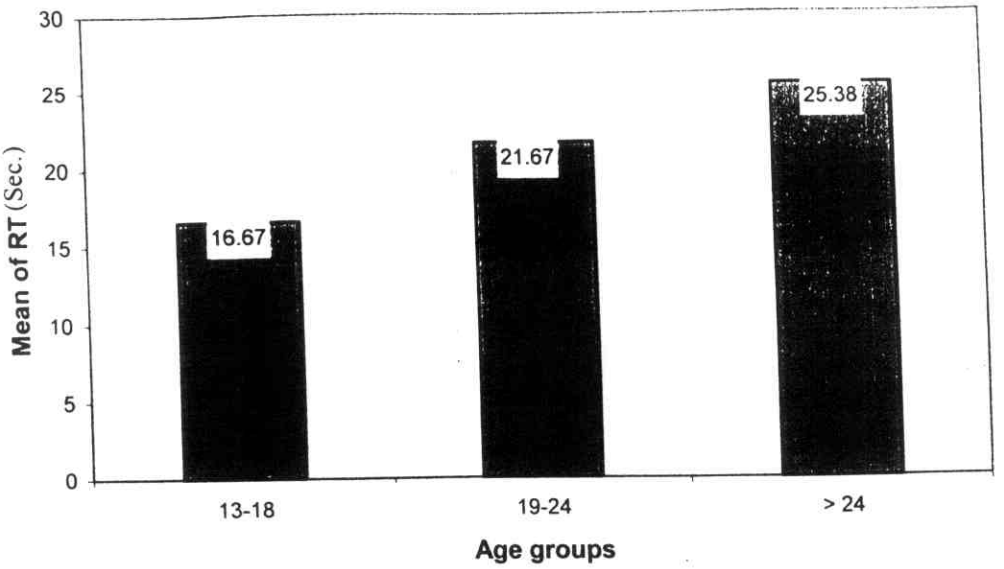
SC = Sperm concentration (× 10^7/ml) **I.M= Individual motility (%)**

Ma.A = Major Abnormality (%) **Mi.A= Minor abnormality (%)**

Table (9): Analysis of variance and F-ratios of buffalo bulls age groups on reaction time and semen characters.

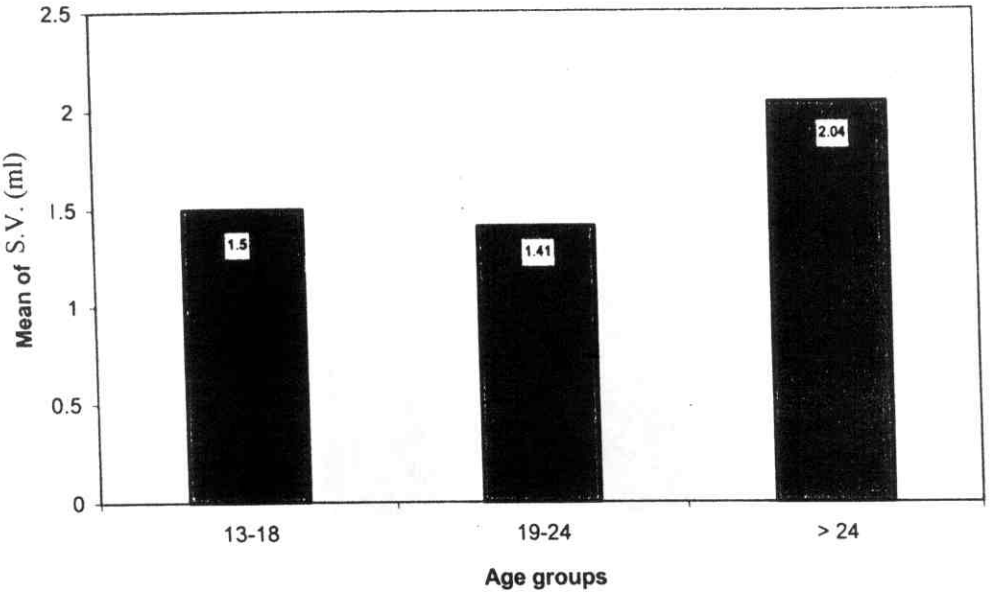
		S.S.	D.F.	M.S	F
R.T	Between	204.196	3	68.065	0.242
	G. Error	5073.077	18	281.838	
S.V	Between	1.896	3	0.630	1.037
	G. Error	10.939	18	0.608	
M.M	Between	2.158	3	0.719	1.391
	G. Error	9.308	18	0.517	
I.M	Between	90.530	3	30.177	0.440
	G. Error	1233.333	18	68.519	
P.L.S	Between	41.762	3	13.921	0.200
	G. Error	1251.192	18	69.511	
S.C	Between	4428.185	3	1476.062	1.134
	G. Error	23424.769	18	1301.376	
Ma.A	Between	33.696	3	11.232	1.356
	G. Error	149.077	18	8.282	
Mi.A	Between	10.465	3	3.488	0.369
	G. Error	170.308	18	9.462	

Fig (21)



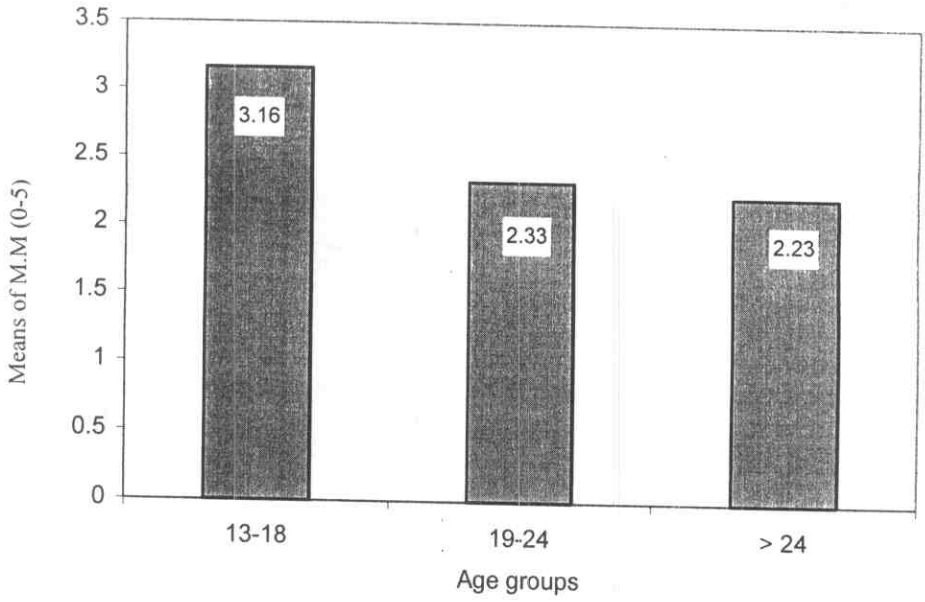
Relation between age groups and reaction time (sec.) in buffalo bulls

Fig (22)



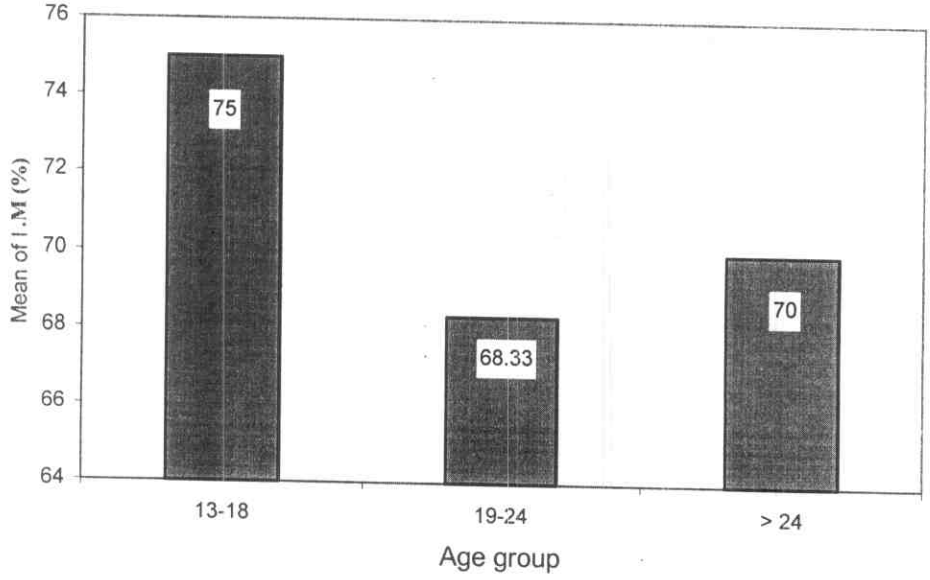
Relation between age groups and semen volume (ml) in buffalo bulls

Fig. (23)



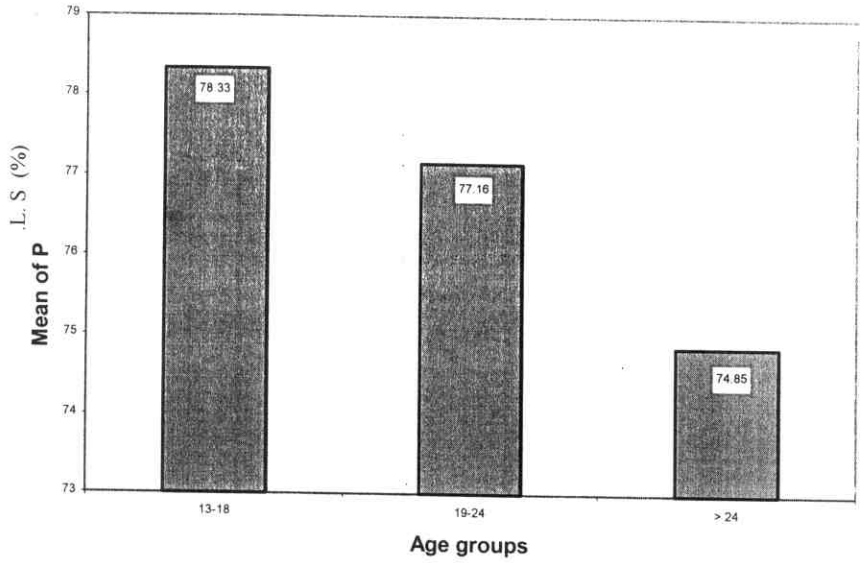
Relation between age group and mass motility (0-5) in buffalo bulls

Fig (24)



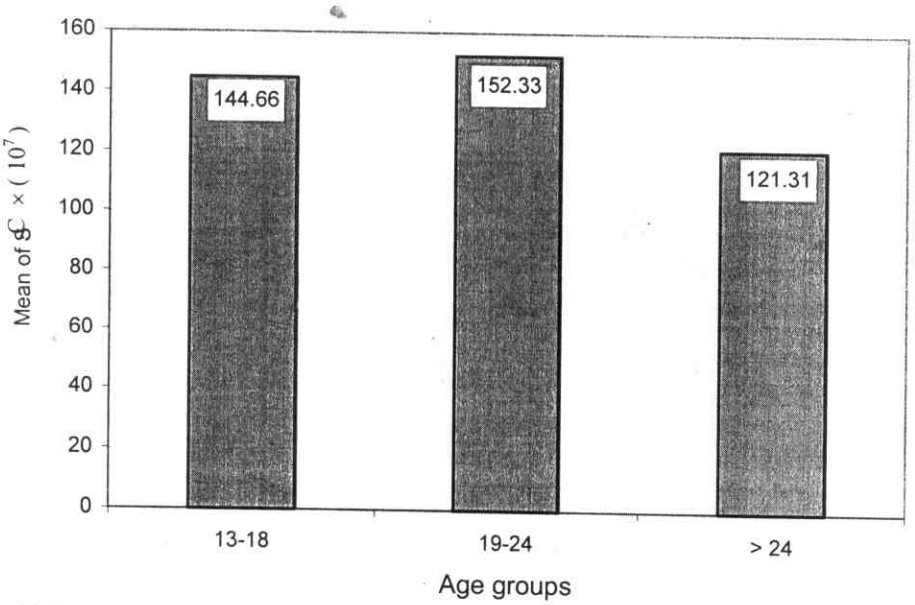
Relation between age groups and individual motility (%) in buffalo bulls

Fig (25)



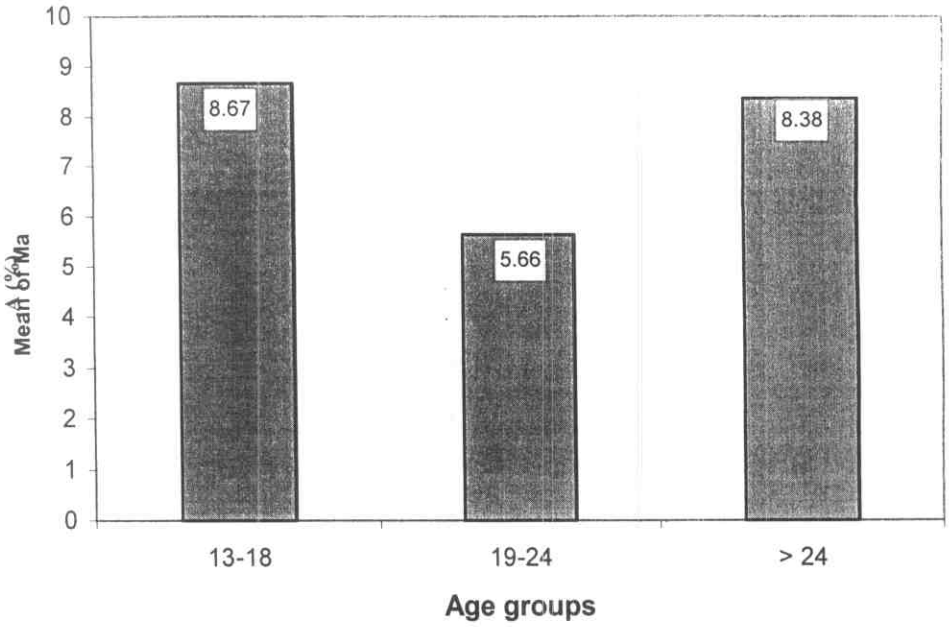
Relation between age groups and percentage live sperm (%) in buffalo bulls

Fig. (26)



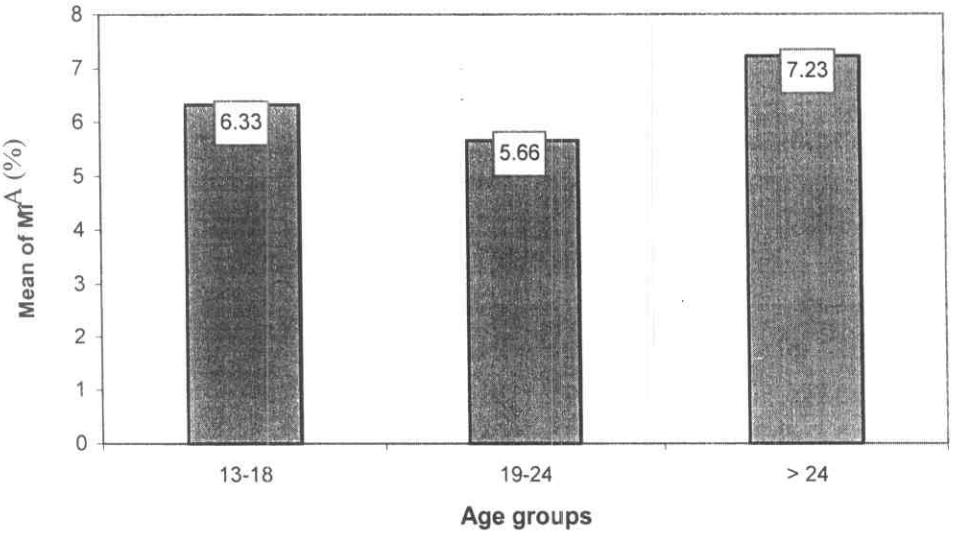
Relation between age groups and sperm concentration ($x10^7$/ml) in buffalo bulls

Fig (27)



Relation between age groups and major abnormality (%) in buffalo bulls

Fig (28)



Relation between age groups and minor abnormality (%) in buffalo bulls

(13-18 months) of age so, the best results for sexual desire was recorded during this stage of age (16.67 ±3.33 sec) campaired with its overall mean value (23.18 ±3.38sec). While, semen volume showed a flactuated trend with lowest values at 19-24 months (1.41 ±0.008 ml) and the highest at > 24 months (2.04 ±0.26) of age groups with an overall mean (1.79 ± 0.17ml).

That was the same for individual motility (I.M) trait where the best value was found at 13-18 months (75.00 ±2.88%) and the lowest value was at 19-24 months (68.33 ±3.07%) with an overall mean (70.22 ±1.69%).

However data was different for mass motility (M.M) trait which showed linear declined trend with advanced bull age. The highest values was attained at 13-18 months (3.16 ±0.16) with an overall mean (2.39 ±0.16).

Similar trends was showed for percent of live sperm (P.L.S), the highest value was recorded at first period of study (78.33 ±2.60%) followed by the second group (77.16 ±2.61%) and the lowest was the third group (74.85 ±2.54%) with overall mean (75.95 ±0.67). This differ from sperm concentration (S.C) that showed variable values throughout the experimental period with highest value at (19-24 months) of age and the lowest during > 24 months with (132.95 ±0.67 × 10^7/ml) overall mean.

The semen abnormalities showed a variable flactuations during age stages with lowest values for both major abnormalities (Ma. A) and minro abnormalities (Mi.A) % at (19-24 months) group and highest ones was at the first age group for (Ma. A) and at the third age group for (Mi. A) traits with grand means (7.68 ± 0.63%) and (6.68 ±0.63%) respectively.

In general, obtained results showed no significant effects on semen characters due to age groups in buffalo bulls which agreed with **Amstalden *et al.*, (1994).** However, **Misra *et al.*, (1994); Singh *et al.*, (1984) and El-Keraby *et al.*, (1996),** showed that age had significant effect on semen characters.

Reaction time in this trial had less mean value (23.18 ±3.38 Sec) than those obtained by **Alexiev *et al.*, (1994); Panwar and Nagpaul, (1994) and Purohit *et al.* (1998)** which were (119.9, 32.6 and 108 sec.), respectively.

4.6. Buffalo bulls semen characteristics:

4.6.1. Semen volume (S.V.)

The study showed that overall mean of semen volume during the whole period of trial was (1.79 ± 0.17 ml) and that was similar to findings of **Amstalden, *et al* (1994)** (1.86 ± 1.39ml) in Murrah buffalo bulls.

While, it was higher than that recorded by **Rajamahendran *et al.*, (1981)** (1.46 ml) in Surti bulls and less than obtained by the same authors (2.82 ml) in Murrah bulls, **Fayez *et al.*, (1985)** (3.6 ±1.8 ml) in Egyptian buffalo bulls and **Panwar and Nagpaul, (1994)** (1-3ml) in Murrah bulls.

4.6.2. Mass Motility: (M.M)

Overall mean of mass motility during all the periods of trial was (2.39 ± 0.16) which higher than registered (1.93) by **El-Feel *et al.*, (1992)** in Egyptian buffalo bulls. While, it was less than what was recorded (3.38) by **El-Hariri, (1973)** in Egyptian buffalo bulls and (3.48 ± 0.19) **Purohit and Rao, (1998)** in Surti

bulls and was nearly to those obtained (2.89) by **Badway, (1971)** and (2.9ml) by **Mohamed, (1981)** in Egyptian buffalo bulls.

4.6.3. Individual Motility (I.M.)

Experimental buffalo bulls had (70.22 ±1.69%) individual motility grand mean, which was higher than that recorded by **Kanakaraj *et al.*, (1984)** (58.35%) in Murrah bulls, **Mathias and Yusuf, (1985)** (64.60%) in indonesion buffalo bulls, **Amstalden *et al.* (1994)** (64.3 ±18.47%), in Murrah bulls, **Metwally, (1994)** (64.90%) in Egyptian bulls and **Fayez, *et al.* (1985)** (63.2 %), in Egyptian bulls. While, it was less than what was recorded by **El-Azab, (1980)** (75.71%), **Mohamed *et al.*(1981)** (76.90%). **El-Feel, *et al.* (1992)** (72.53%) in Egyptian buffalo bulls, and less than findings of **Singh, *et al.* (1983)** (83.60%), **Misra, *et al.* (1994)** (72.5%) in Murrah bulls and (72.45%) in Surti bulls and **Purohit *et al.*, (1998)** (72.45%) in Indian Surti bulls.

4.6.4. Percentage of live sperms: (P.L.S)

The overall mean of P.L.S during the whole periods of trial was recorded average means of 75.95 ± 0.67% for percentage live sperm (P.L.S). It was similar to **Fayez, *et al.* (1985)** (76.6%) for Egyptian buffalo bulls and less than of **El-Azab, *et al.* (1977)** (83.46%) and (1980) (80.4%), **Mohamed, *et al.* (1981)** (85.4%) in Egyptian buffalo bulls and **Purohit *et al.*, (1998)** (77.04 ± 2.08%) in Surti bulls. While, it was higher than of **kanakaraj, *et al.* (1984)** (65.1%) in Murrah bulls.

4.6.5. Sperm concentration : (S.C)

Sperm concentrations as one of the most studied important semen quality traits had a higher (132.95 ± 7.76 × 10^7/ml) overall mean value than that was recorded (1139.63 × 10^6/ml) by **El-Azab *et al.* (1977)** and (857.45 × 10^6 / ml) reported by **El-Azab (1980)** and (1.27 x 10^9 ml) reported by **El-Feel, *et al.* (1992)** for Egyptian buffalo bulls. **Mathias and Yusuf (1985)** (1000 × 10^6 /ml) for Indonesian bulls, **Purohit, *et al.* (1998)** (941.02 ± 28.32 × 10^6/ml) in Surti bulls.

4.6.6. Sperm abnormalities:

4.6.6.1. : Major abnormalities (Ma.A)

Study showed that overall mean of major abnormalities (Ma.A) was (7.68 ± 0.63%). This was less than recorded by **Mathias and Yusuf (1985)** (22.55 ± 17.67%) in Murrah buffalo bulls, while was higher than those obtained by **El-Azab *et al.*, (1977)** (1.83%) in Egyptian bulls and **Mathias and Yusuf (1985)** (4.5%) in Indonesian bulls.

4.6.6.2. Minor abnormalities : (Mi.A)

The study showed that overall mean of minor abnormalities (Mi.A) was (6.68 ±0.63%). This was similar to what was recorded by **El-Azab (1980)** (6.69%) in Egyptian bulls, while it was higher than **El-Azab *et al.* (1977)** (5.84%) and less than that recorded by **Metwally, (1994)** (12.82 ±1.38%) in Egyptian bulls and **Amstalden, *et al.* (1994)** (7.23 ±6.96%) in Murrah bulls.

4.7. Individuality of body measurements in cow bulls:

The effect of individuality on body dimension in cow bulls are tabulated in tables (10 & 11) and Figures (29-34), where the measurements were done 13 times for each of 9 bulls studied.

Results revealed that, correlation values between individual bull and body dimensions are variable and not constant.

Effect of individuality showed an increase in the bulls body weight but is not in the same rate, while it decrease in other dimensions in case of bull No. 2., while its body weight, F.L and P.W increased, the H.G., B.L and D.B.T.C were decreased.

Even in case of bull No.5 and No.6 the averages of their body weight were nearly the same (366.23 & 366.92kg) the obtained results showed that H.G, F.L, P.W and D.B.T.C were higher in bull No_5 than those of bull No. 6 in different rates (157.31 v.s 155.76, 50.00 v.s 49.62, 48.92 v.s 44.54 and 41.38 v.s 39.23). However, B.L was shorter (79.23cm) than that of bull No_6 (83.38cm) in spite of weight of bull No6 is slightly heavier than No_5 one.

The individual differences in all studied body measurements were highly and significantly correlated with age ($P<0.01$) (Table 11).

Table (10): Individuality of body measurements in cow bulls (Mean ±S.E.)

No. of bull	No. of measurements	BW. Kg	H.G. Cm	B.L Cm	F.L Cm	P.W Cm	D.B.T.C Cm
1	13	318.92 ±26.49	151.31 ±3.22	73.77 ±2.85	44.31 ±1.38	44.69 ±0.96	41.07 ±1.53
2	13	325.46 ±28.05	148.38 ±3.41	70.92 ±3.01	44.76 ±1.36	45.53 ±1.24	40.00 ±1.36
3	13	327.85 ±26.37	153.23 ±3.03	81.00 ±2.88	45.92 ± 1.25	45.77 ±0.81	40.15 ±1.72
4	13	344.85 ± 25.99	155.77 ± 2.78	81.31 ±2.71	46.85 ±1.49	46.46 ±1.16	42.15 ±2.99
5	13	366.23 ±27.91	157.31 ±2.67	79.23 ±3.13	50.00 ±1.30	48.92 ±1.14	41.38 ±1.55
6	13	366.92 ±29.96	155.76 ±2.86	83.38 ±2.42	49.62 ±1.31	44.54 ±1.29	39.23 ±1.77
7	13	373.54 ±25.38	161.46 ±21.50	89.69 ±21.19	56.31 ±0.91	52.92 ±1.76	42.46 ±1.57
8	13	404.00 ±24.68	164.92 ±2.38	96.61 ±1.92	52.46 ±1.35	54.53 ±1.54	43.46 ±1.57
9	13	437.62 ±23.15	171.77 ±2.71	99.07 ±1.85	55.69 ±1.69	59.85 ±1.77	44.69 ±1.72
Total	117	362.82 ±9.19	157.77 ±1.12	83.89 ±1.18	49.55 ±0.59	49.25 ±0.64	41.62 ±0.60

B.W. = Body weight (kg) **H.G. = Heart gearth (cm)**

B.L= Back length (cm) **F.L= Femur length (cm)**

P.W = Paunch width (cm)

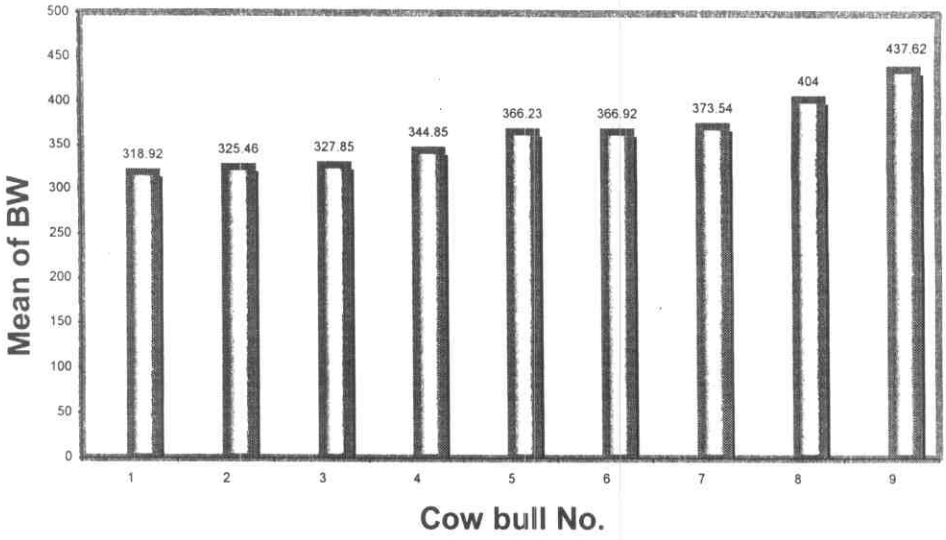
D.B.T.C= Distance between tuber. Coxa (cm)

Table (11): Analysis of variance and F-ratio tests of individuality body measurements in cow bulls.

Traits	S.O.V	S.S.	D.F.	M.S	F
B.W.	Between	159930.2	8	19991.269	2.188 **
	G. Error	986939.1	108	9138.325	
H.G	Between	5452.796	8	681.596	6.412**
	G. Error	11480.000	108	106.296	
B.L	Between	9539.402	8	1192.425	13.668**
	G. Error	9422.152	108	87.242	
F.L	Between	2117.453	8	264.682	11.108**
	G. Error	2573.538	108	23.829	
P.W	Between	2996.274	8	374.534	16.144**
	G. Error	2505.538	108	23.199	
D.B.T.C	Between	320.530	8	40.066	0.935
	G. Error	4628.923	108	42.860	

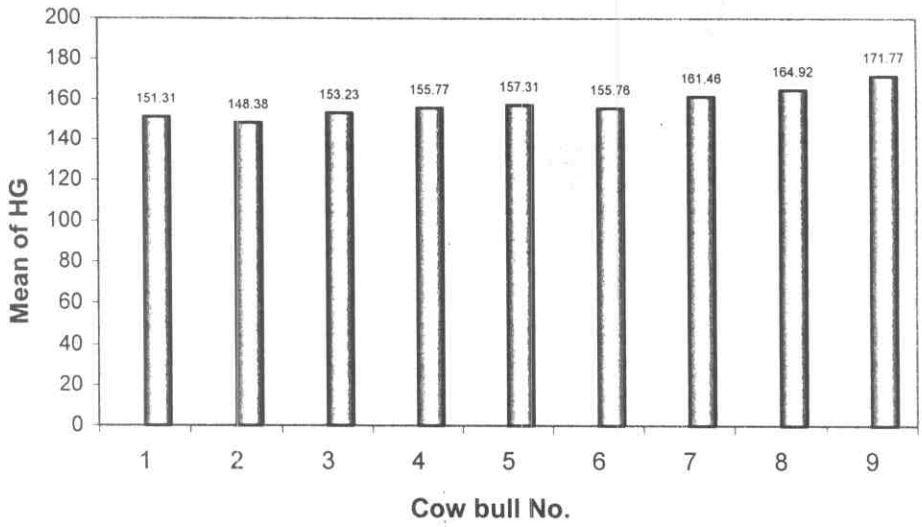
Where ** = P< 0.01

Fig. (29)



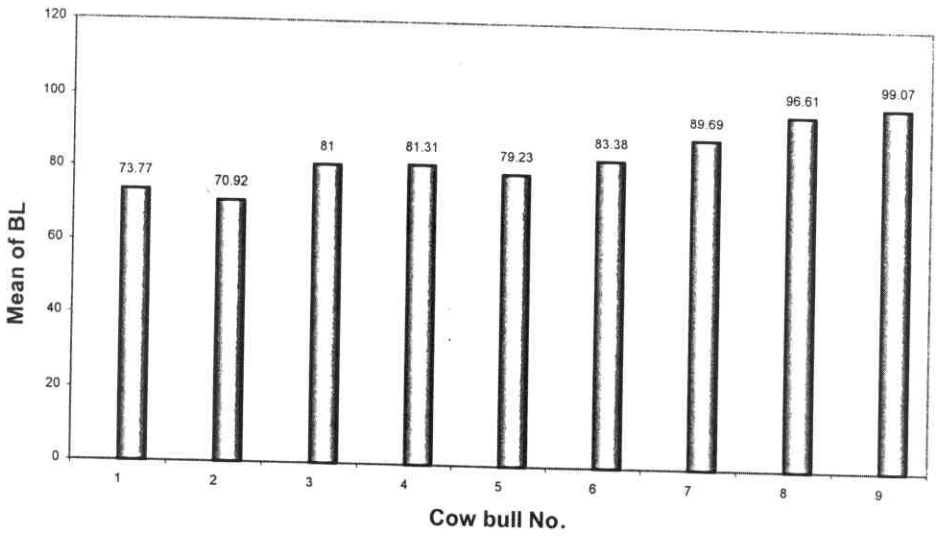
Individual variation of body weight (kg) in cow bulls

Fig (30)



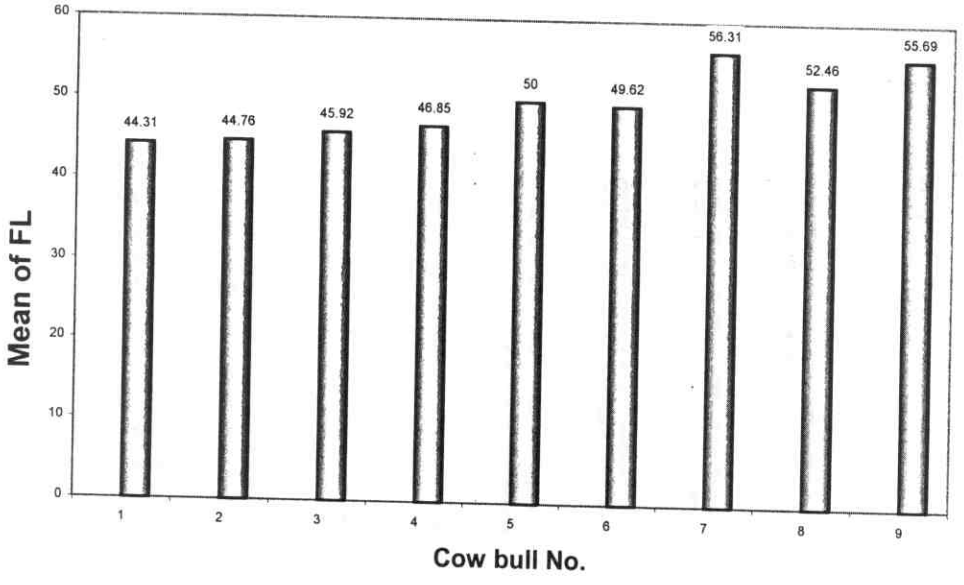
Individual variation of heart girth (cm) in cow bulls

Fig (31)



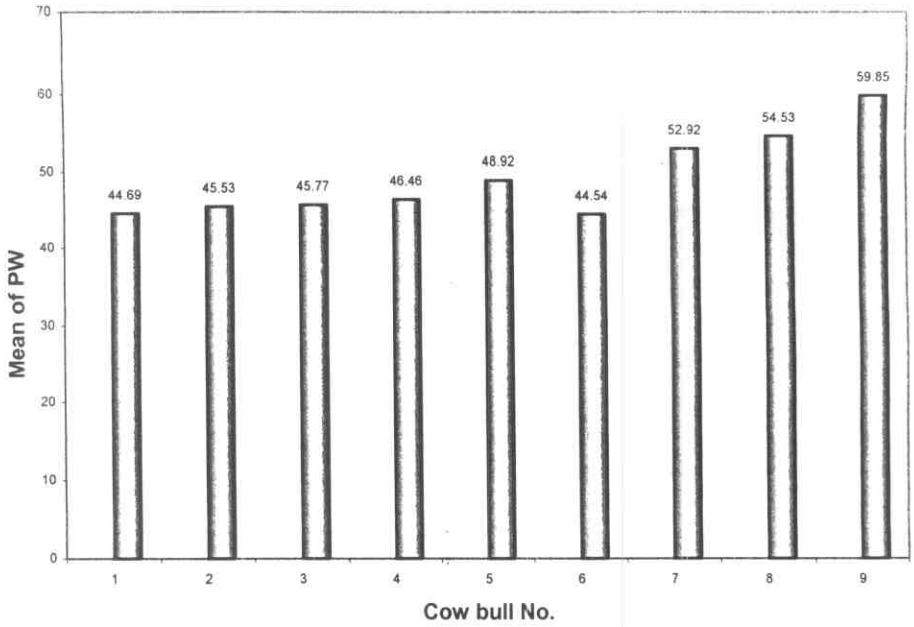
Individual variation of back length (cm) in cow bulls

Fig (32)



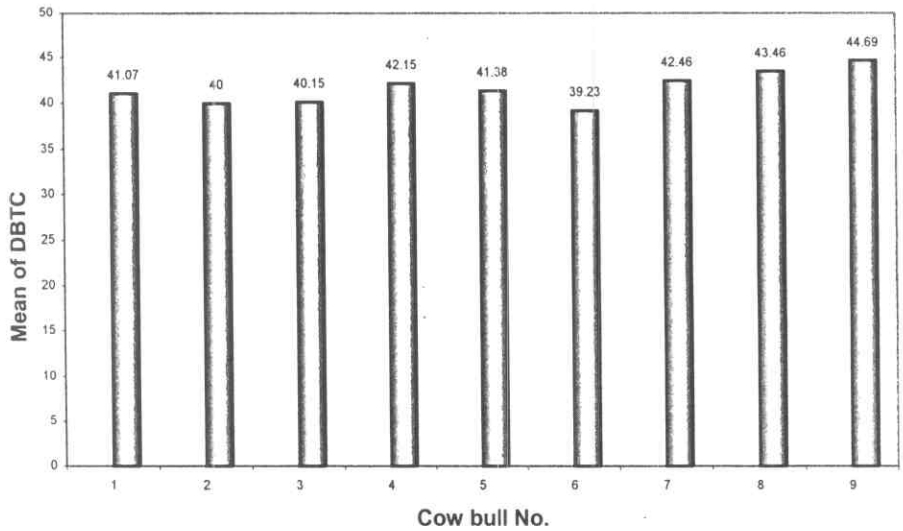
Individual variation of femur length (cm) in cow bulls

Fig. (33)



Individual variation of paunch width (cm) in cow bulls

Fig. (34)



Individual variation of dsitance between tuber coxa (cm) in cow bulls

4.8. Individuality of body measurements in buffalo bulls:

Tables (12 and 13) and Figuers from 35 to 40 revealed the effect of individuality on body dimension in buffalo bulls, where measurements were done 13 times for each of 5 bulls. Results showed that correlation between individuality and body dimensions is variable and not constant. Body weight for whole bulls was increased, but not in the same rate as bulls No_4 and No_5, they recorded the highest mean values (409.31 ±22.45 kg) and (403.85 ±20.96kg), respectively, while bulls No_2 recorded the lowest mean values (282.31 ±21.96 kg).

Also, other body dimensions showed variable increases at different rates between bulls. Bulls No_4 and No_5 recorded the highest mean values for H.G, B.L, while No_2 showed the lowest results of BW; HG and B.L.

This was different for F.L, as bulls No_2 recorded the highest value (62.23 ±2.11), bulls No_4 recorded the lowest value between bulls (52.77 ±2.08). In general, results showed that bulls No 4 and 5 gave the best results between whole bulls with highly significant increase in body dimensions for them during all experimental periods ($P<0.01$).

4-9- Individuality of reaction time and semen characters in cow bulls:

Tables (14 and 15) and Figures (41 to 48) revealed the individuality variations in reaction time (R.T) and semen characters of cow bulls, which showed variable values of R.T with overall mean (12.41 ±1.07sec) with highest value for the bull No_5 (14.50 ±2.83 sec) and lowest value for bull No_8 (8.91 ±1.67 sec.) so, sexual desire was the best for bull No_8.

Table (12): Individuality of body measurements in buffalo bulls (Mean ±S.E.)

No. of bull	No. of measurements	BW. Kg	H.G. Cm	B.L Cm	F.L Cm	P.W Cm	D.B.T.C Cm
1	13	298.92 ±23.10	146.92 ± 4.10	107.92 ±2.02	53.85 ±2.27	54.15 ±2.54	50.15 ±3.31
2	13	282.31 ±21.96	143.31 ±4.26	105.69 ±1.91	62.23 ±2.11	61.61 ±2.16	53.77 ±3.18
3	13	387.77 ±23.13	166.00 ±3.18	113.85 ±1.96	54.38 ±2.51	61.77 ±1.74	53.31 ±2.33
4	13	409.31 ±22.45	171.23 ±2.88	117.46 ±1.90	52.77 ±2.08	60.62 ±1.39	52.92 ±2.06
5	13	403.85 ±20.96	169.46 ±2.86	115.07 ± 1.87	58.46 ±2.40	65.15 ±2.10	54.69 ±1.94
Total	65	356.43 ±11.83	159.38 ±2.12	112.00 ±1.01	56.33 ±1.08	60.66 ±0.98	52.97 ±1.15

B.W. = Body weight (kg) **H.G. = Heart gearth (cm)**

B.L= Back Length (cm) **F.L = length Femur (cm)**

P.W = Paunach width (cm)

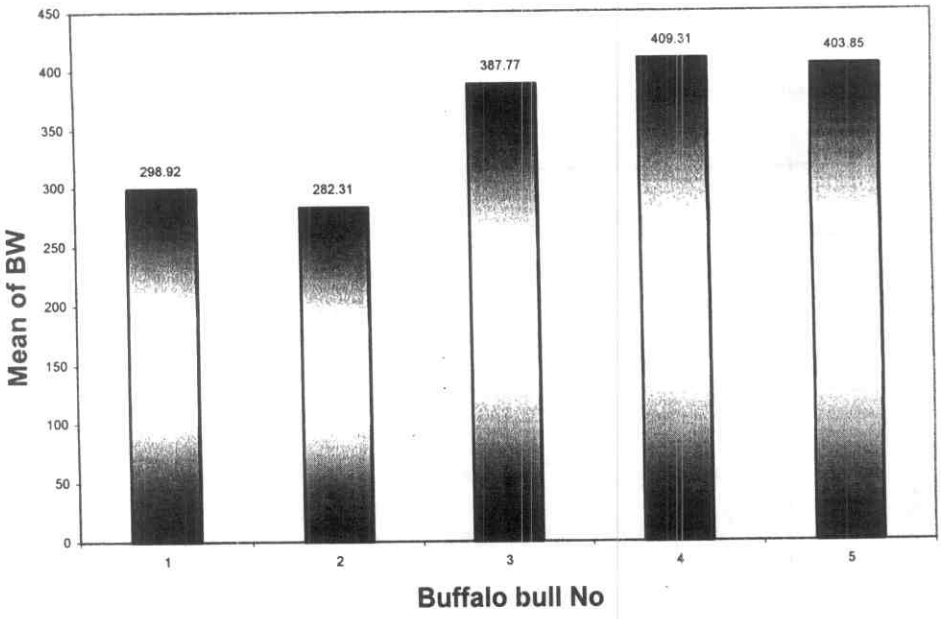
D.B.T.C=Distance between tuber. Coxa (cm)

Table (13): Analysis of variance and F-ratios of individuality body measurements in buffalo bulls .

Traits	S.O.V	S.S.	D.F.	M.S	F
B.W.	Between	192759.5	4	48189.869	7.431**
	G. Error	389074.5	60	6484.574	
H.G	Between	9092.154	4	2273.038	14.190 **
	G. Error	9611.231	60	166.187	
B.L	Between	1288.462	4	322.115	6.624 **
	G. Error	2917.538	60	48.626	
F.L	Between	805.938	4	201.485	2.983**
	G. Error	4052.615	60	67.544	
P.W	Between	840.708	4	210.177	3.931**
	G. Error	3207.846	60	53.464	
D.B.T.C	Between	151.477	4	37.869	0.421
	G. Error	5398.462	60	89.974	

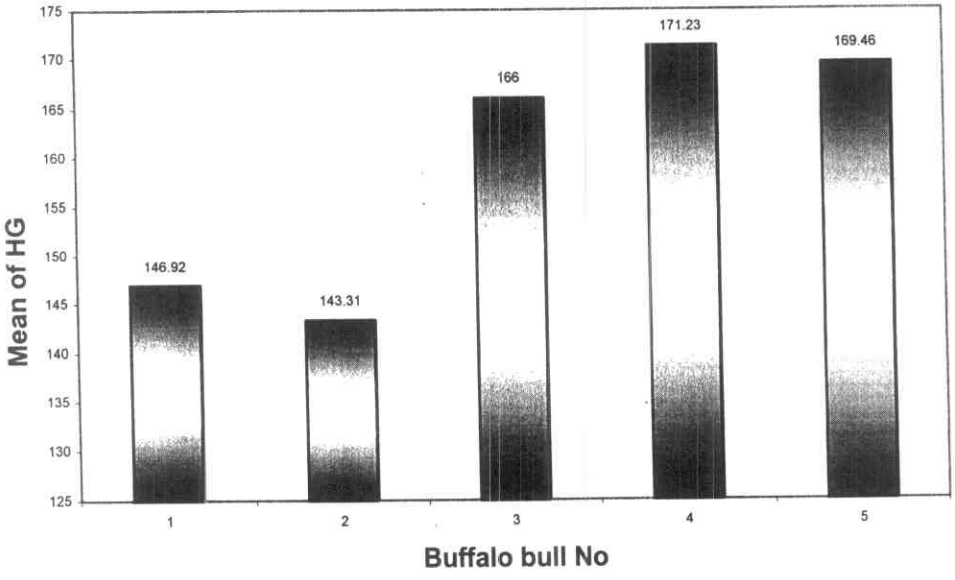
Where ** = P< 0.01

Fig. (35)



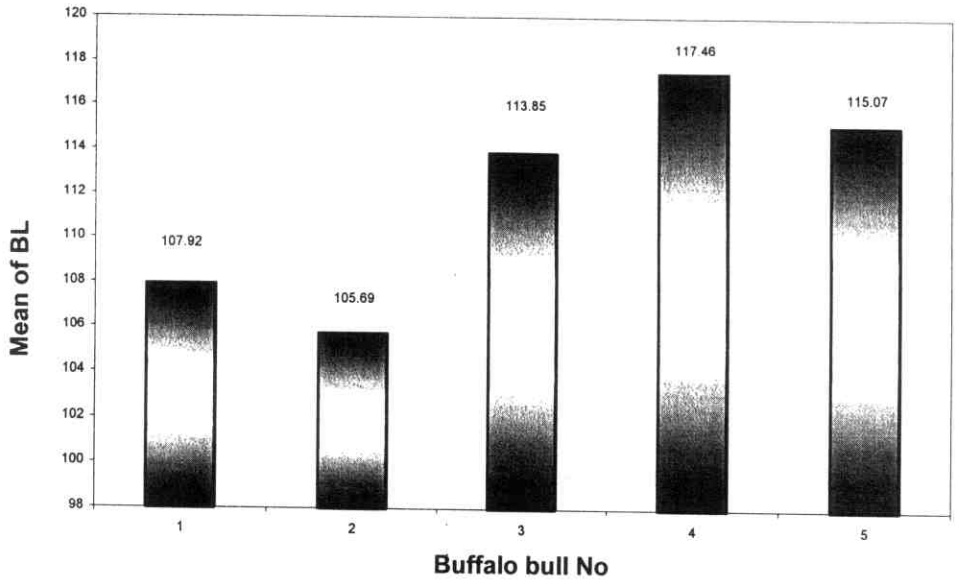
Individual variation of body weight (kg) in buffalo bulls

Fig. (36)



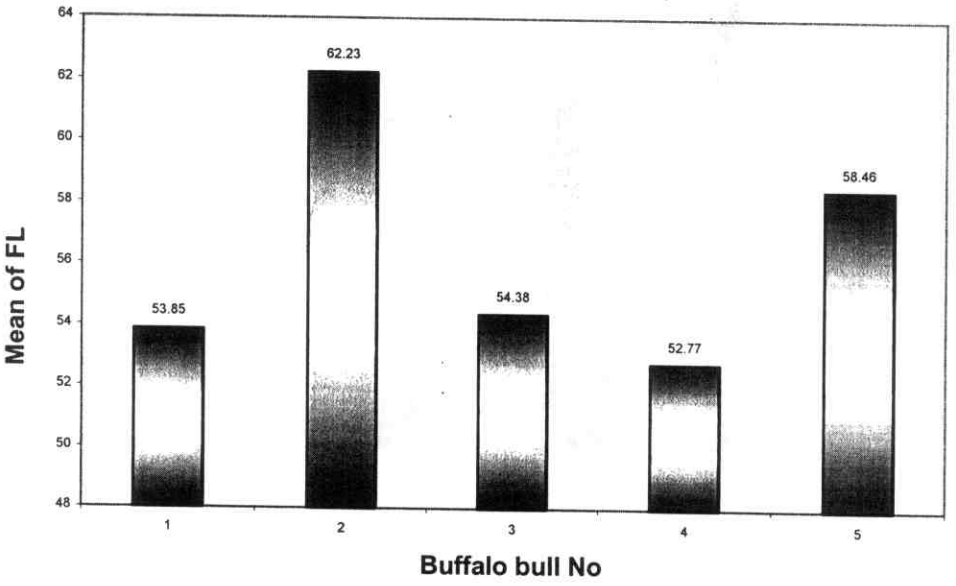
Individual variation of heart girth (cm) in buffalo bulls

Fig. (37)



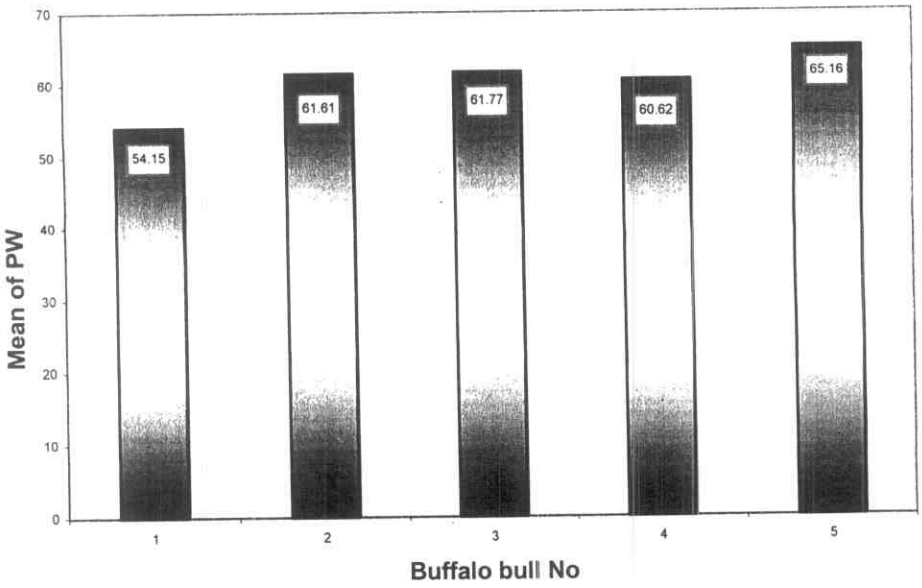
Individual variation of back length (cm) in buffalo bulls

Fig. (38)



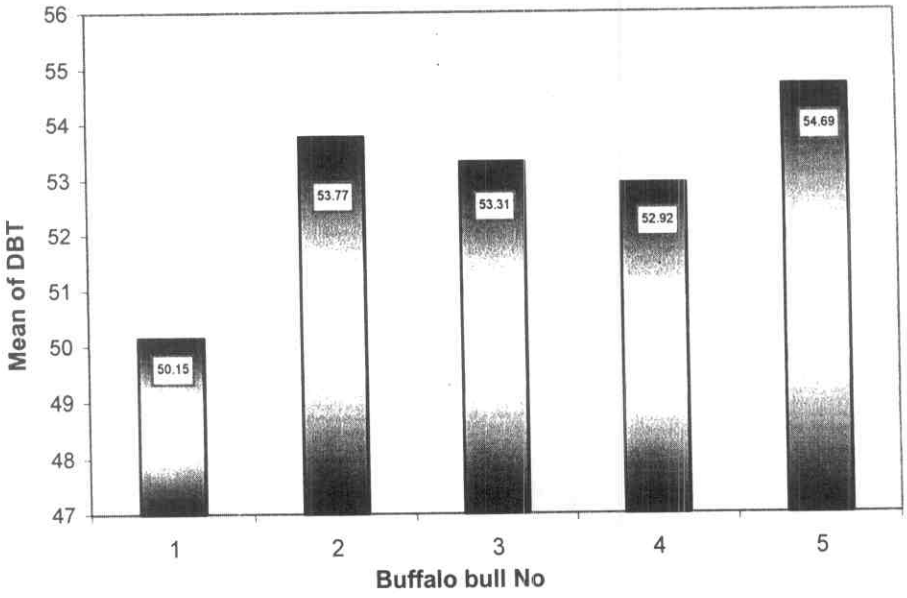
Individual variation of femur length (cm) in buffalo bulls

Fig (39)



Individual variation of paunch width (cm) in buffalo bulls

Fig. (40)



Individual variation of distance between tuber coxa (%cm) in buffalo bulls

Table (14): Individuality of reaction time and semen characters in cow bulls (Mean ±S.E.)

No. of bull	No. of sample	R.t Sc	S.V Ml	MM 0-5	I.M %	PLS %	SC× 10^7/ml)	Ma.A %	Mi.A %
5	10	14.50 ±2.83	4.25 ±0.46	3.05 ±0.26	78.0 ±1.33	82.50 ±1.50	122.10 ±6.91	3.30 ±0.65	5.10 ±0.86
6	7	12.86 ±2.86	6.64 ±0.64	3.43 ±0.23	80.71 ±1.30	84.28 ±1.52	127.14 ±9.61	4.57 ±0.72	4.142 ±0.67
7	10	12.00 ±2.38	6.05 ±3.23	3.00 ±0.26	79.00 ±2.08	82.10 ±2.04	169.40 ±11.18	4.90 ±0.86	2.50 ±0.43
8	11	8.91 ±1.67	4.59 ±0.35	3.04 ±0.14	79.55 ±1.05	84.18 ±0.93	99.45 ±8.00	4.54 ±0.98	4.55 ±0.85
9	13	13.84 ±2.28	2.84 ±0.36	3.08 ±0.15	77.31 ±2.16	82.23 ±2.49	147.69 ±11.38	4.76 ±0.55	4.69 ±0.57
Total	51	12.41 ±1.07	4.65 ±0.66	3.09 ±9.077 E-02	78.73 ±0.78	82.96 ±0.84	133.71 ±5.47	4.43 ±0.34	4.23 ±0.32

R.t= reaction time (sec) **I.M= Individual motility (%)**

S.V= Semen volume (ml) **P.L.S= Percentage live sperms (%)**

M.M. = mass motility (0-5) **Ma.A= major abnormality (%)**

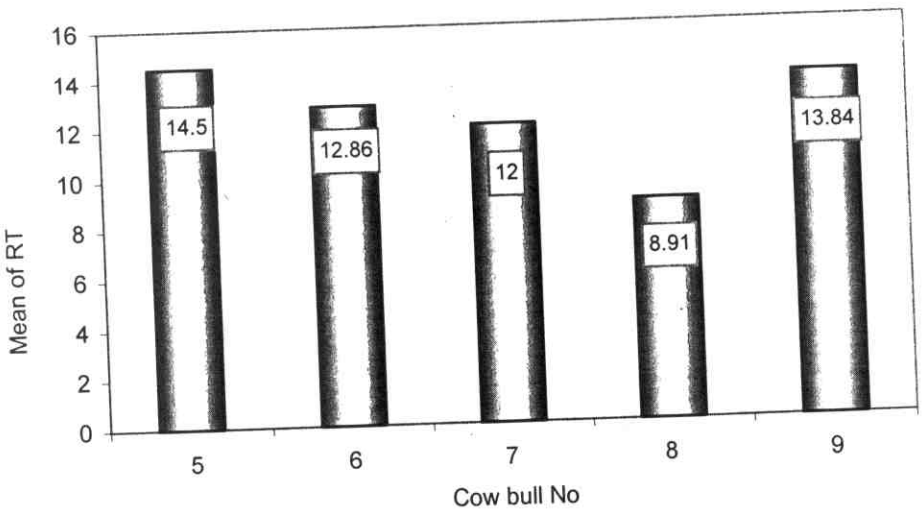
Mi.A = Minor abnormality (%)

Table (15): Analysis of variance and F-ratios of individuality on reaction time and semen characters in cow bulls.

Characters	S.O.V	S.S	D.F	M.S	F
R.T	Between G.	208.394	4	34.732	0.568
	Error	2689.959	46	61.135	
S.V	Between G.	91.339	4	15.223	0.662
	Error	1012.309	46	23.007	
M.M	Between G.	0.920	4	0.153	0.336
	Error	20.090	46	0.457	
I.M	Between G.	67.232	4	11.205	0.334
	Error	1474.925	46	33.521	
P.L.S	Between G.	45.149	4	7.525	0.191
	Error	1736.773	46	39.472	
S.C	Between G.	29836.935	4	4972.822	4.685 ***
	Error	26699.654	46	1061.356	
Ma. A	Between G.	16.761	4	2.793	0.436
	Error	281.749	46	6.403	
Mi. A	Between G.	41.423	4	6.904	1.311
	Error	231.754	46	5.267	

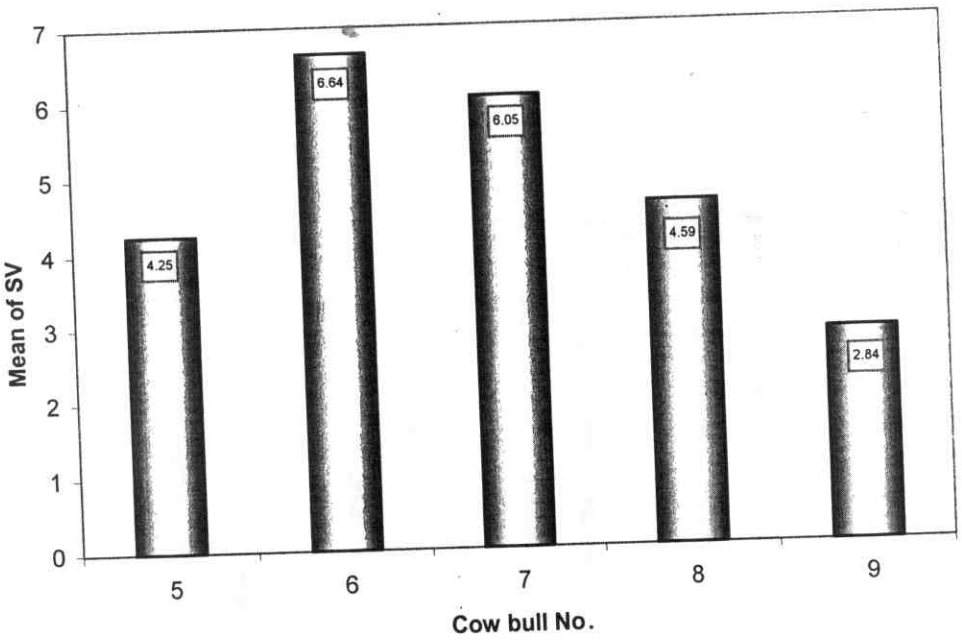
Where *** = P< 0.001

Fig. (41)



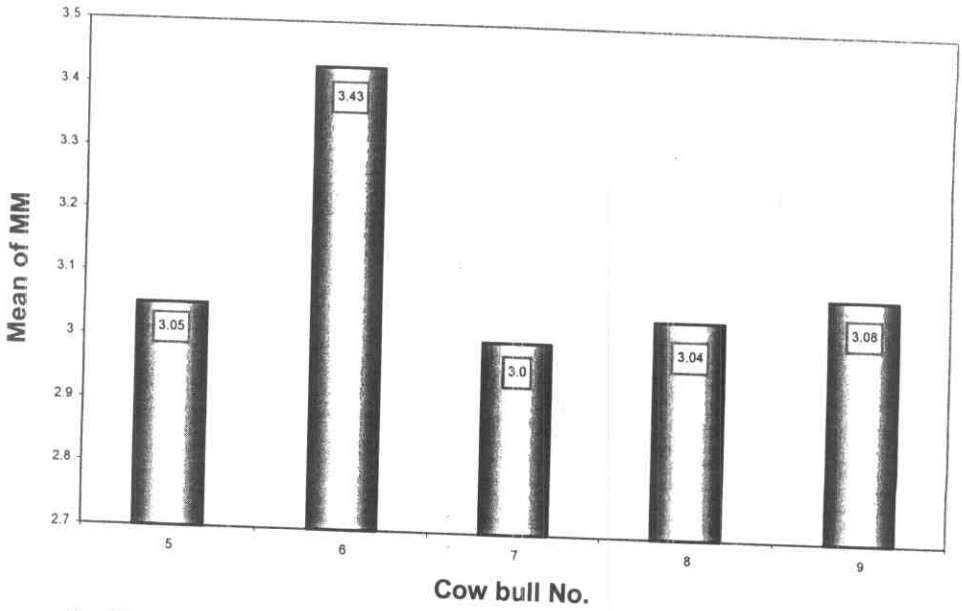
Individual variation of reaction time (sec) in cow bulls

Fig. (42)



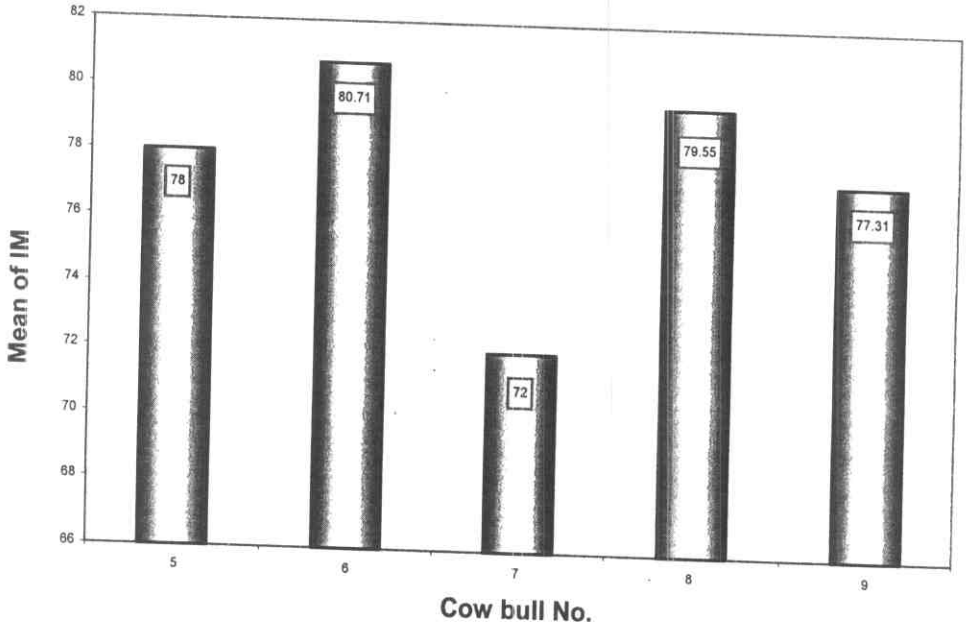
Individual variation of semen volume (ml) in cow bulls

Fig (43)



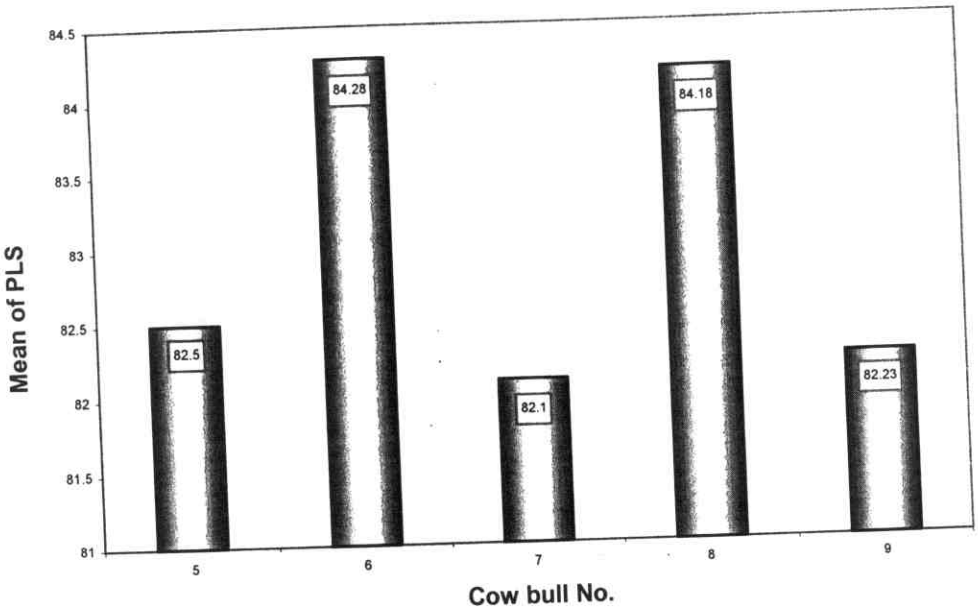
Individual variation of mass motility (0-5) in cow bulls

Fig. (44)



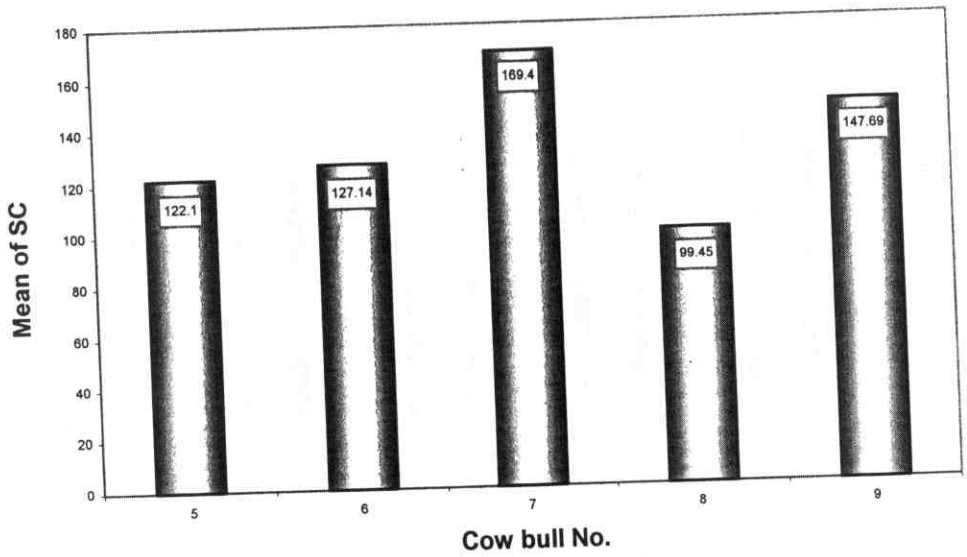
Individual variation of individual motility (%) in cow bulls

Fig (45)



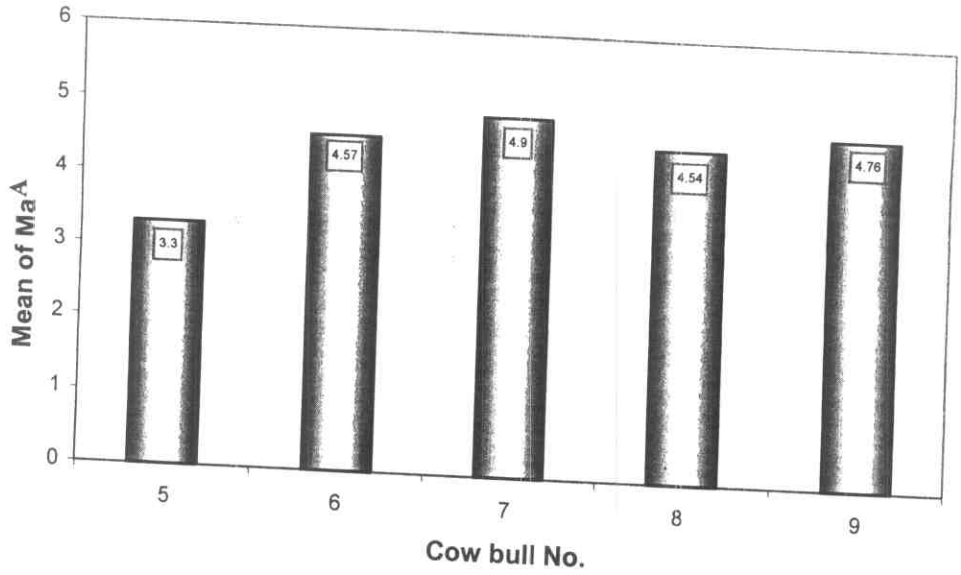
Individual variation of percentage live sperm (%) in cow bulls

Fig (46)



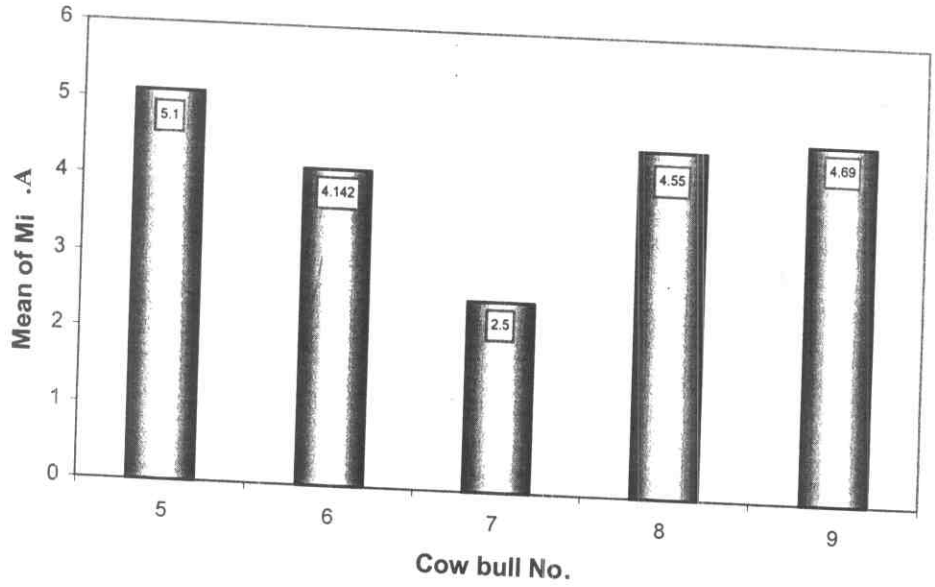
Individual variation of sperm concentration (x 10^7/ml) in cow bulls

Fig (47)



Individual variation of major abnormality (%) in cow bulls

Fig (48)



Individual variation of minor abnormality (%) in cow bulls

The highest value of semen volume (S.V) was for bull No_6 (6.64 ± 0.64ml) and the lowest for bull No_9 (2.84 ± 0.36ml) with overall mean of S.V (4.65 ±0.66ml) So, I.M, and M.M of semen quality were differed between bulls with highest values for bull No_6 and lowest values for bull No_9 with overall mean of I.M (78.73 ±0.78%) and M.M (3.09 ±9.077 E-02 ml).

This similar to P.L.S as the highest value was recorded for bull No_6 and the lowest for bull No_7 (overall mean was 82.96 ±0.84%). Differences between all studied cow bulls semen quality were not significant except only for semen concentration trait (S.C) ($P< 0.001$) which its mean was highest in bull No_7 (169.4×10^7ml) and lowest for bull No_8 (99.45×10^7 /ml) with overall mean was ($133.71 \pm 5.74 \times 10^7$/ml). Bull No_7 recorded also the highest value of (Ma.A) and The lowest value was for bull No_5 with overall mean was (4.43 ±0.34%) while bull No_7 recorded lowest value for (Mi.A) (2.5 ±0.43%) and the highest value was for bull No_5 (5.1 ±0.86%) compaired with its grand mean (4.23 ±0.32%).

Chandler *et al.*, (1987) observed that semen quality was differed significantly between and within studied Holstein bulls. Also **Garner *et al.*, (1996)** found that individual Holstein bulls differed ($P< 0.05$) in semen volume and sperm concentration.

4.10. Individuality of reaction time and semen characters in buffalo bulls:

Tables (16 and 17) and Figures from (49 to 56) illustrated individuality of reaction time and semen characters in buffalo bulls. Concerning mean of reaction time results showed the

Table (16): Individuality of reaction time and semen characters in buffalo bulls (Mean ±S.E.)

Bull No.	No. of sample	R.T Sc.	S.V ml	MM 0-5	I.M %	PLS %	SC × 10^7/ml)	Ma.A %	Mi.A %
3	10	19.00 ±5.09	1.45 ±8.975 E-02	2.65 ±0.28	71.50 ±2.36	78.20 ±1.78	152.100 ±4.92	6.70 ±0.58	5.500 ±0.68
4	6	20.00 ±5.00	2.00 ±0.26	2.25 ±0.21	72.50 ±2.50	76.50 ±2.40	146.83 ±12.68	8.33 ±1.35	6.83 ±1.45
5	6	33.33 ±6.76	2.16 ±0.51	2.08 ±0.23	65.83 ±3.96	71.66 ±4.73	87.16 ±10.72	8.67 ±1.63	8.50 ±1.17
Total	22	23.18 ±3.38	1.79 ±0.17	2.39 ±0.15	70.23 ±1.69	75.95 ±1.67	132.95 ±7.76	7.68 ±0.62	6.68 ±0.62

R.t= reaction time (sec.) **I.M= Inidividual motility(%)**

S.V= Semen volume (ml) **P.L.S= Percentage live sperms (%)**

M.M. = mass motility (0-5) **Ma. A= Major abnormality (%)**

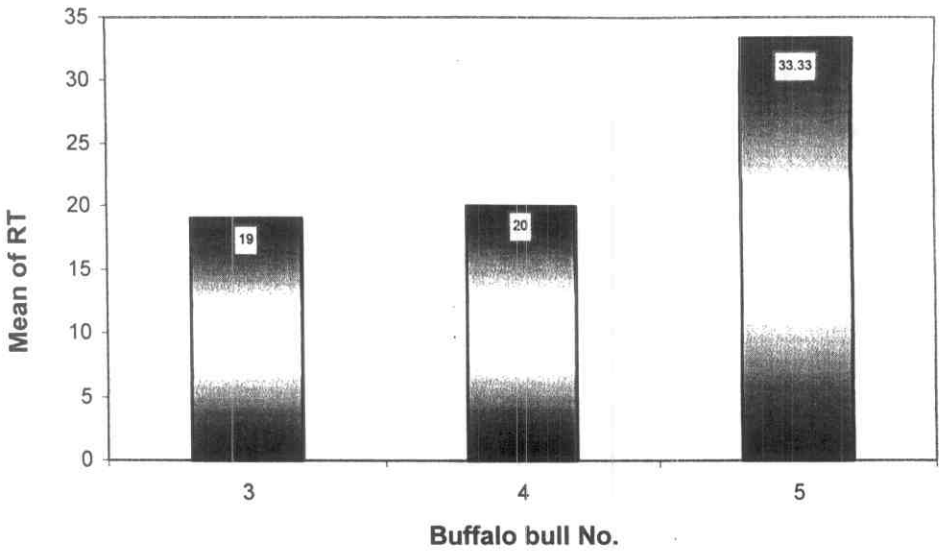
Mi. A = Minor abnormality (%)

Table (17): Analysis of variance and F-ratios of individuality reaction time and semen characters in buffalo bulls.

Character	Source of variance	S.S	D.F	M.S	F
R.T	Between	853.939	4	213.485	0.820
	G. Error	4423.333	17	160.196	
S.V	Between	2.271	4	0.568	0.914
	G. Error	10.558	17	0.621	
M.M	Between	1.358	4	0.339	0.571
	G. Error	10.108	17	0.595	
I.M	Between	163.030	4	40.758	0.597
	G. Error	1160.833	17	68.284	
P.L.S	Between	162.521	4	40.630	0.611
	G. Error	1130.433	17	66.496	
S.C	Between	17400.388	4	4350.397	7.075**
	G. Error	10452.567	17	614.857	
Ma. A	Between	18.006	4	4.502	0.464
	G. Error	164.767	17	9.692	
Mi. A	Between	33.939	4	8.485	0.982
	G. Error	146.833	17	8.637	

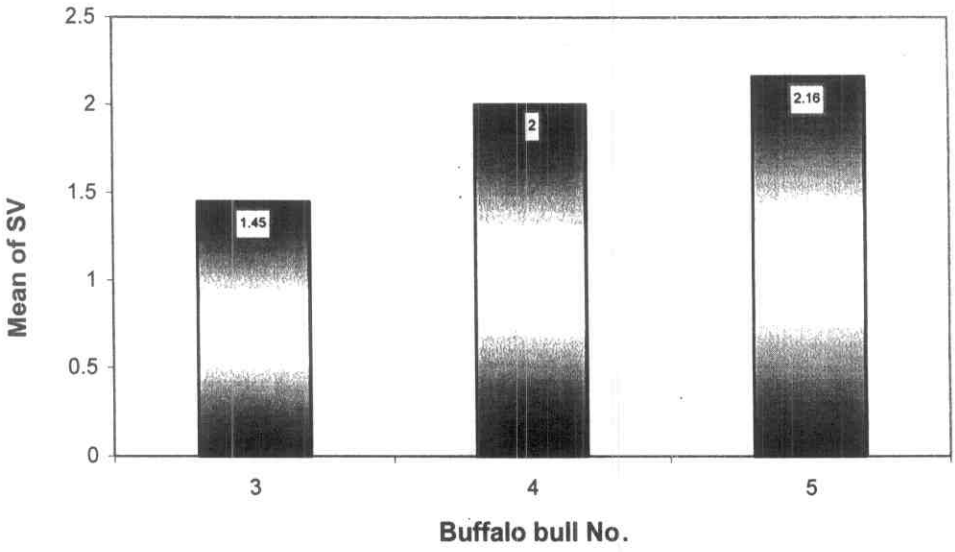
Where ** = P< 0.01

Fig. (49)



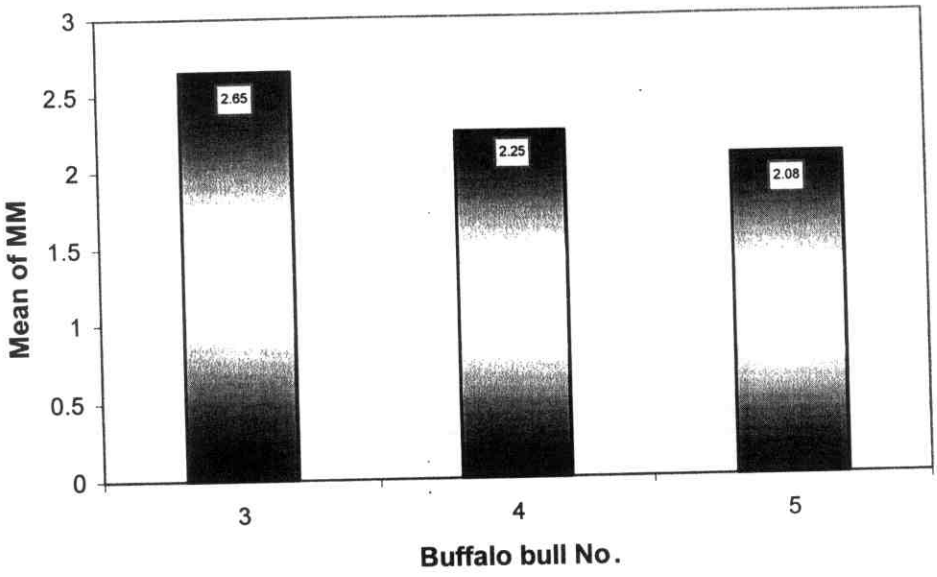
Individual variation of reaction time (sec) in buffalo bulls

Fig. (50)



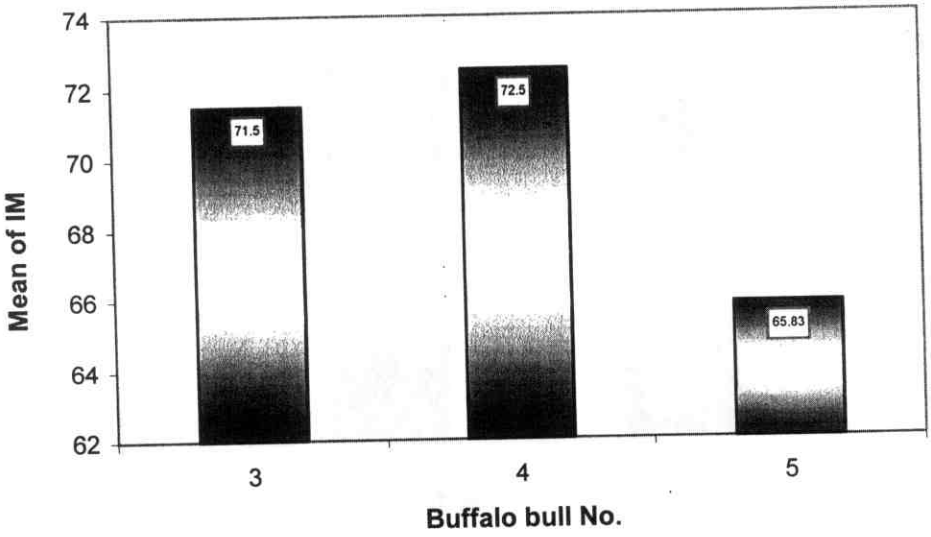
Individual variation of semen volume (ml) in buffalo bulls

Fig. (51)



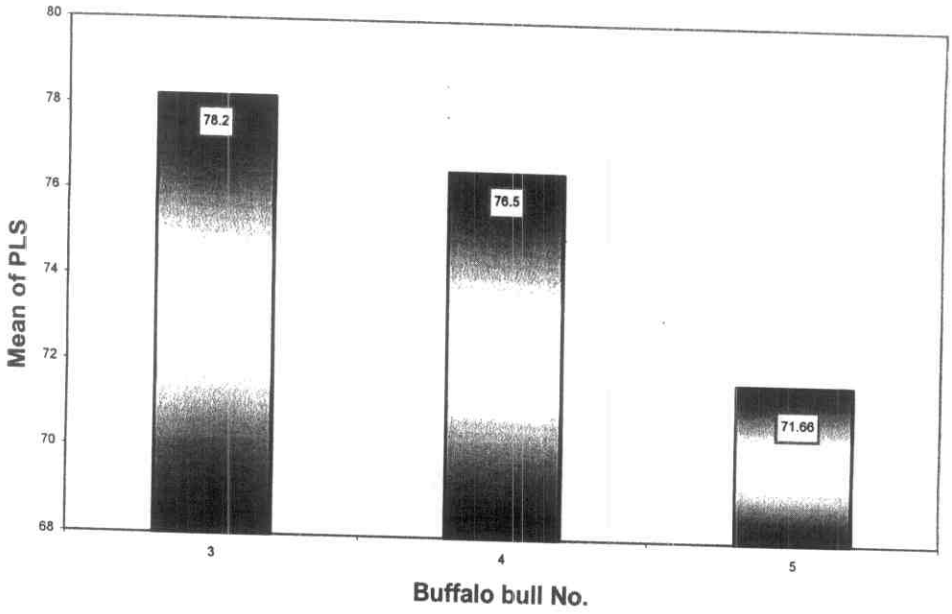
Individual variation of mass motility (0-5) in buffalo bulls

Fig. (52)



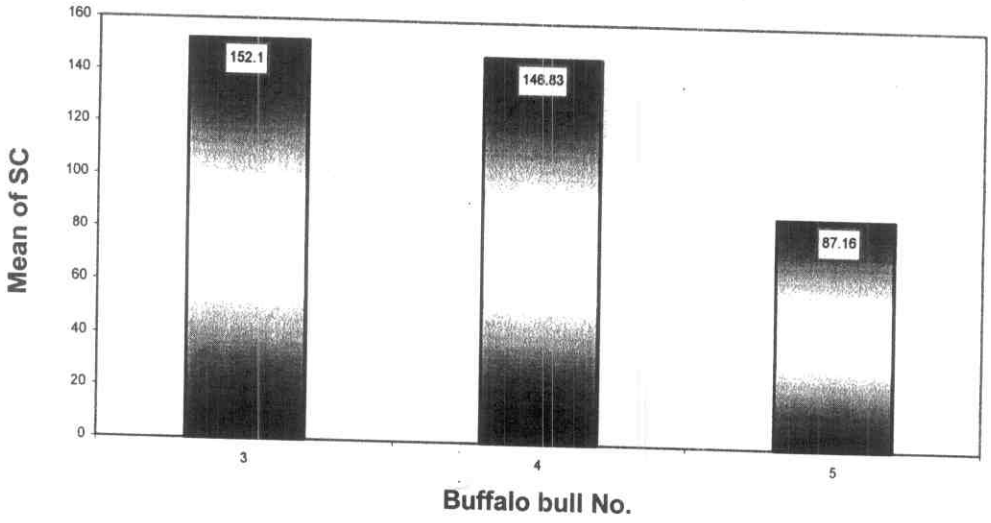
Individual variation of individual motility (%) in buffalo bulls

Fig (53)



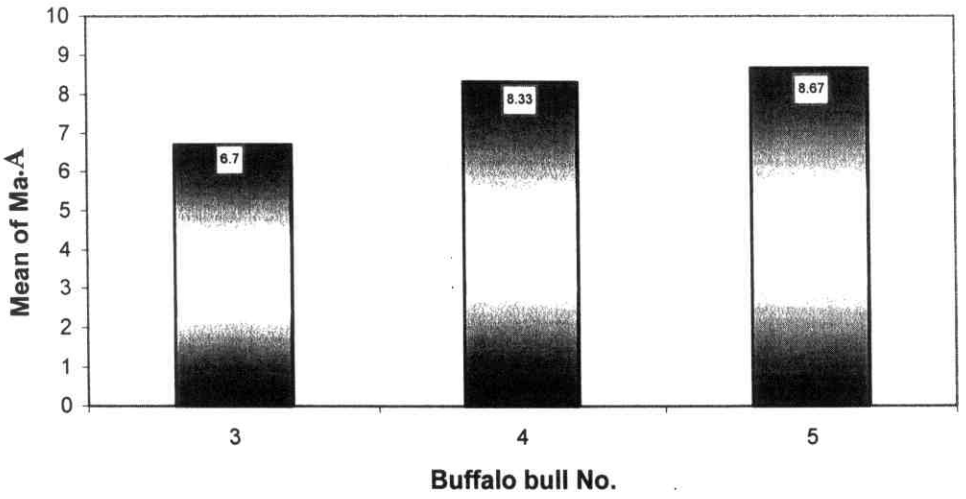
Individual variation of percentage of live sperm (%) in buffalo bulls

Fig (54)



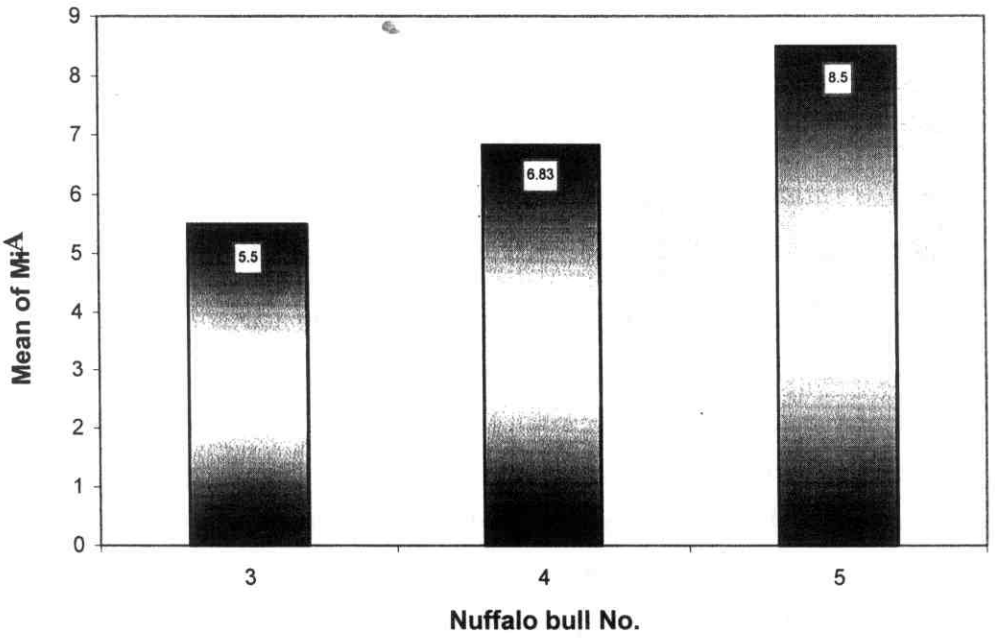
Individual variation of sperm concentration ($\times 10^7$/ml) in buffalo bulls

Fig (55)



Individual variation of major abnormality (%) in buffalo bulls

Fig (56)



Individual variation of minor abnormaility (%) in buffalo bulls

highest values (33.33 ±6.67sec) for bull No_5 while lowest value (19.00 ± 5.09sec) was for the bull No_3 (best results of sexual desire was for bull No_3) compaired with overall mean was (23.18 ± 3.38 sec). This was similar to what recorded for means of semen volume which were (2.16 ±0.5ml) for bull No_5 and (1.45 ± 8.97 E-02) for bull No_3 and with overall mean(1.79 ±0.17ml) respectively.

However it was the contrary for M.M and I.M traits that recorded highest mean values in bull No_3 while, bull No_5 showed lowest results and with overall mean (2.39 ±0.15) and 70.23 ±1.69% for M.M and I.M respectively. This agreed with results of P.L.S & S.C that showed highest values for bull No_3 and lowest values for bull No_5 with corresponding overall means of P.L.S was 75.95 ±1.67% and 132.95 ±7.76 × 10^7/ml for S.C

The same trend for Ma.A & Mi.A as the lowest values of sperm abnormalities were observed by bull No_3 while, highest mean values of abnormalities were for bull No_5 with overall mean of 7.68 ± 0.62% and 6.68 ±0.62 %, respectively.

Obtained reaction time during this trail was (23.18 ±3.38 sec.) which was less than those recorded (119.9, 32.6 and 108 sec) by **Alexiev *et al.*, (1994), Panwar and Nagpaul (1994) and Purohit *et al.*, (1998)** respectively. All mentioned authors showed that differences between individual bulls were significant while, **Alexiev *et al.*, (1994)** it recorded highly significant differences for sperm concentration which agreed with the only significant result ($P<0.01$) between individual bulls in this study (Table 17). Also **Misra *et al.*, (1994)** showed

significant differences between individual bulls for all semen quality traits.

4.11. Levels of plasma testosterone in cow bulls :

Tables (18) and Figuers (57 and 58), revealed the effect of age groups and bull individuality on plasma testosterone level in cow bulls. Results showed that the peak level of testosterone was recorded at 8-12 months of age (at puberty stage). While, Table (18) and Figuers (58) showed variable levels of testosterone among studied cow bulls during at puberty stage as highest level of hormone was recorded by bull No_1 while, lowest level of testosterone was for bull No_2.

Concerning variation in testosterone concentration between cow bulls studied during after- puberty stage, bull No_8 recorded the higher level (1.3 ±0.16 ng/ml) while, bull No_9 recorded the lower level (0.8 ±0.46 ng/ml). In general, the overall mean was 1.01 ng/ml. However, all differences either between cow bull age groups or, individual bull variations were not significant (table 19).

While, **Swanson *et al.*, (1971),** at 10, 11 and 12 months in Holstein, found that testosterone concentration was (5.54 ±0.7; 4.2 ±0.7 and 4.34 ±0.016 ng/ml) respectively. While, for **Kwiatkowski *et al.*, (1983)** at 14th month was 1 ng/ml in lowland breeds, for **Govined *et al.*, (1992)** was 1.5 to 7.11 ng/ml, for **Sousa *et al.*, (1996)** at 2-19 months was 2.38 ng/ml in Czech pied bulls, for **Thomas *et al.*, (2002)** in 3 breeds (Angus, Brangus and Brahman bulls was 10.6; 8.9 and 4.0 ng/ml respectively.

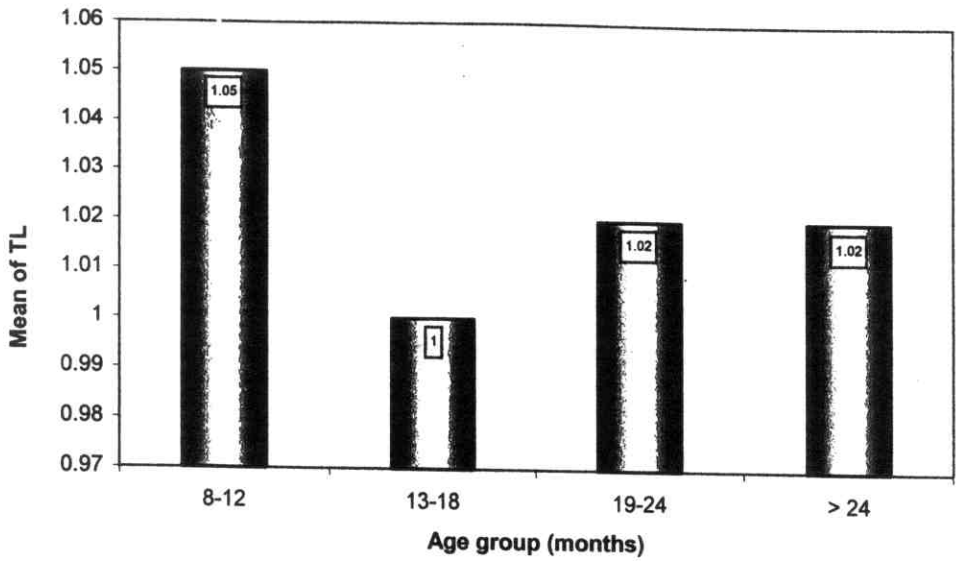
Table (18) : Mean ± S.E of plasma testosterone levels in cow bulls

Age Groups months	No. of samples	Mean ± S.E (ng/ml)	Individuality (Cow bull No.)	No. of Samples	Mean±S.E (ng/ml)	Sexual stage
8-12	8	1.05±0.46	1	11	1.2±0.45	at Puberty
13-18	18	1.00±0.28	2	11	0.8±0.31	
19-24	14	1.02±0.39	8	12	1.3±0.46	After puberty
> 24	7	1.02±0.18	9	13	0.8±0.16	
Overall mean	47	1.01±0.17	Overall mean	47	1.01±0.17	

Table (19): Analysis of variance and F- ratios for age and individuality on cow bulls plasma testosterone levels.

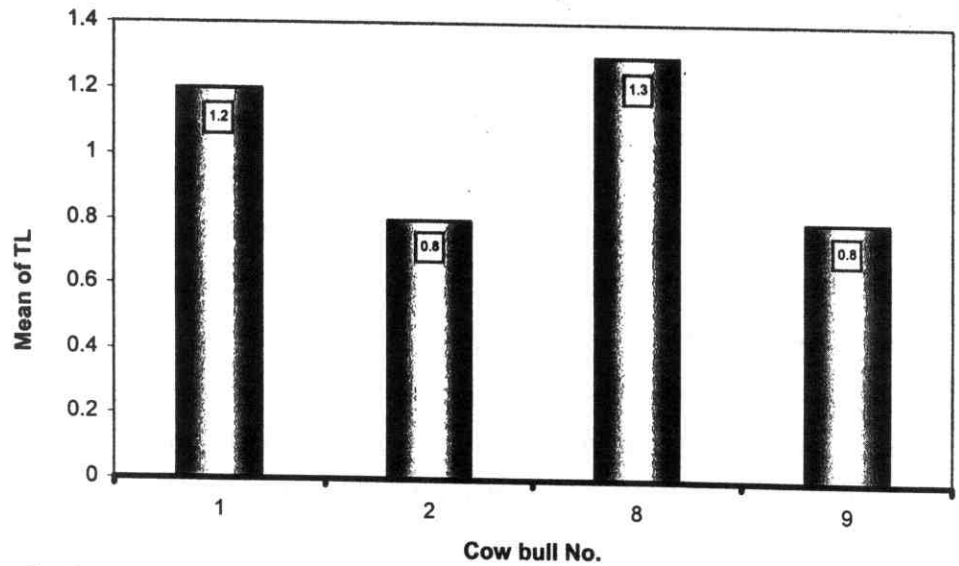
Factor		S.O.V	S.S	D.F	M.S	F
Age	T.L	Between G.	2.109 E-02	3	7.032 E-03	0.004
		Error	68.618	43	1.596	
Individuality	T.L	Between G.	1.832	4	0.305	0.183
		Error	66.808	42	1.670	

Fig (57)



Relation between age group and plasma testosterone level (T.L) (ng./ml) in cow bulls

Fig (58)



Individual variation of plasma testosterone level (T.L) (ng./ml) in cow bulls

4.12. Age of puberty in cow bulls :

Results revealed that average age of 1st ejaculation in cow bull during this trail was (17 months). This was less than what recorded by **Troconiz, *et al.* (1991)** (18 ±0.2 months) in Nellore bulls, **El-Feel *et al.* (1992)** (18months) in Holstein Freisian bulls and **Rao, *et al.* (2000)** was (27.18 ±0.82 months) in Ongole bulls, **Gilardi, *et al.* (2001)** was (18 months) in Nellore bulls. While, was higher than what were recorded by **Tamaya, *et al.* (1991)** (8-13) months and **Madrid, *et al.* (1994)** was (13.3 months) in Brahman × Holstein bulls.

4.13. Level of plasma testosterone in buffalo bulls :

Presented data in Table (20) showed the effect of bulls age groups and individuality on mean ±S.E of plasma testosterone levels in buffalo bulls during pre and after puberty age. Previous table and Figuer (59) showed that there was variations in plasma testosterone hormone levels between different studied stages of age but bulls at period from 8-12 months of age recorded the average highest of testosterone level (1.3 ±0.89 ng/ml) while, its level decrease with progress of age from 19 to 24 month (0.2 ±0.1 ng/ml) and increased at > 24 months to reach 0.3 ±0.14 ng/ml but, with little difference between the other stages of age.

Figure (60) showed variations in the level of testosterone hormone between bulls, as bull No_1 recorded the highest mean of testosterone (1.0 ±0.73 ng/ml), bull No_4 recorded the lowest one (0.1 ± 4.56 ng/ml), comparing with the grand mean (0.4 ± 0.17 ng/ml) along experimental period. However, **Abdel Khalik (1981)** at 3-16 months of age found that testosterone level was

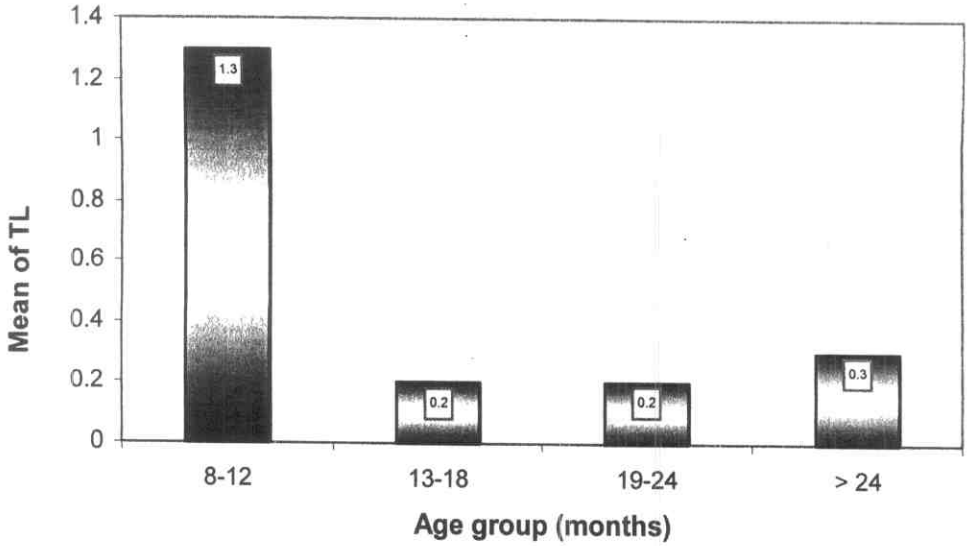
Table (20) : Mean ± S.E plasma testosterone levels in buffalo bulls

Age	No. of sample	Mean± S.E (ng/ml)	Individuality buffalo No.	No. of Sample	Mean± S.E (ng/ml)	Sexual stage
8-12	11	1.3±0.89	1	11	1.0±0.73	**at Puberty**
13-18	12	0.2±0.10	2	12	0.5±0.18	
19-24	13	0.2±6.23 E-02	3	13	0.2±9.25 E-02	**After puberty**
> 24	13	0.3±0.14	4	13	0.1±4.56 E-02	
Overall mean	49	0.4±0.17	Over all mean	49	0.4±0.17	

Table (21): Analysis of variance and F-ratios for age and individuality on buffalo bulls plasma testosterpne levels

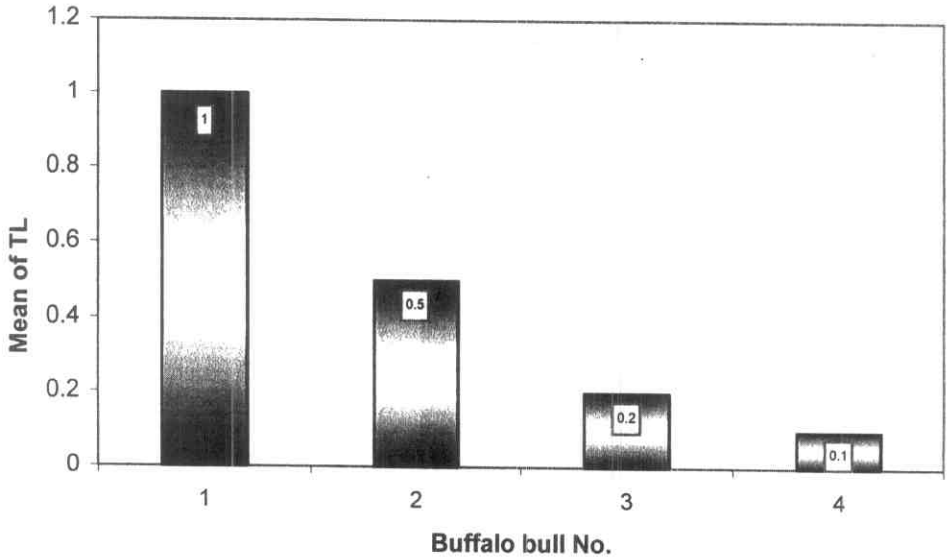
Factor		S.O.V	S.S	D.F	M.S	F
Age	T.L	Between G.	8.021	3	2.674	1.928
		Error	62.403	45	1.387	
Individuality	T.L	Between G.	4.969	3	1.242	0.835
		Error	65.455	45	1.488	

Fig (59)



Relation between age group and plasma testosterone level (T.L) (ng./ml) in buffalo bulls

Fig (60)



Individual variation plasma testosterone level (T.L) (ng./ml) in buffalo bulls

(1.16 to 0.31 ng/ml) while at 8-16 months was (0.31 to 0.59 ng/ml). Otained results showed higher testosterone level than the finding of **Rajamahendran and Guanarayasingam, (1982)** at 12 months stated that it was 0.2 ng/ml and at age of 24 months was 0.3 ng/ml. But by **Suri and Madan, (1981)** was (0.11-0.24 ng/ml) from 0-8 months and by **Ahmad *et al.*, (1989)** was (0.3 ±0.1 ng/ml) at age 0-12 months of age. And less than that found by the same authors at 14 months (2.7 ±0.9 ng/ml) and at 18 months of age was (3.3 ±1.3 ng/ml). While in results obtained by **Mokhless and Ibrahim, (1990)** at 12, 15, 18, 21 and 24 months of age was (0.10, 0.26, 0.10, 0.33 and 0.50 ng/ml) respectively.

4.14. Age of puberty in buffalo bulls :

Results showed that average age of 1st ejaculation in buffalo bulls during this trail was (20 months) with body weight attained (329 kg) which was more than that obtained by **El- Feel, *et al.* (1992)** was (15 months) in Egyptian buffalo and by **Sayed, (1958)** (19 months) at body weight was 280 kg and less than findings of **Ahmed *et al.*, (1989)** 22 months and body weight was 421 kg, **Ahmed *et al.* (1984), Sharm *et al.*, (1984); and McCool and Entwistle (1989);** was (24 months) in swamp buffalo and **Elkachab (1994)** was (24 months) in Egyptian buffalo.

4.15. Correlation coefficients between Age, body weight, body measurement, libido, semen characteristics and plasma testosterone levels in cow bulls.

Data in table (22) confirmed that correlation coefficient values between cow bulls body weights and ages as well as between different body dimensions studied were significantly

Table (22): Correlation coefficients between body weight, body measurements, libido, semen characteristics and plasma testosterone levels in cow bulls.

Traits	Age	B.W	H.G	B.L	F.L	P.W	D.B.T.C
B.W	0.936**						
H.G	0.958**	0.946**					
B.L	0.900**	0.837**	0.921**				
F.L	0.953**	0.886**	0.923**	0.876**			
P.W	0.903**	0.841**	0.901**	0.863**	0.894**		
D.B.T.C	0.817**	0.883**	0.818**	0.690**	0.758**	0.741**	
R.T	0.083	0.079	0.074	-0.083	0.121	0.056	0.102
S.V	-0.163	0.207	0.091	-0.006	0.136	-0.017	0.166
M.M	0.131	0.150	0.129	0.097	0.10	-0.003	0.098
I.M	0.146	0.159	0.184	0.089	0.133	0.032	0.160
P.L.S	0.115	0.121	0.198	0.149	0.055	0.044	0.106
S.C	0.390**	0.332*	0.434**	0.236	0.613**	0.413**	0.403**
Ma.A	-0.248	-0.275	-0.226	-0.094	-0.128	-0.065	-0.250
Mi.A	-0.123	-0.073	-0.111	-0.116	-0.250	-0.124	-0.157
T.L	0.070	0.082	0.088	0.077	0.069	0.041	0.125

Where : ** = ($P<0.01$)

Where : * = ($P<0.05$)

higher (P<0.01) and positive (ranged between 0.690 to 0.955) while, it was only significant (P<0.01) between previous mentioned traits and sperm concentration (S.C) and varied from 0.332 to 0.613 except between (S.C) and back length (B.L) measure (0.236). On the other side sperm abnomalities percentages (both of Major & Minor) was low and negatively (-0.065 to –0.275) correlated with cow bulls age, weights, dimensions and libido (R.T) studied traits. Testosterone hormone level was found to be positively but low (0.041 to 0.088) correlated with different body dimensions, weights and ages of cow bulls. While **Garner *et al.* (1996)** observed that aging was significantly correlated with ejaculate volume (r = 0.76; P < 0.01) but not significantly correlated with the total number of spermatoza per ejaculate (r = 0.51). Also **Urrea *et al.* (2001)** showed that a storng relationship was found between age and each physical traits, with the highest correlations were found for body weight and sperm concentration (R=0.796, P< 0.01 and R=0.454, P<0.01) respectively. While **Jovanovac *et al.* (1998)** found that the highest correlation were found between growth traits (body weight, body measuerments) and semen quality traits (ejaculate volume (S.V), sperm concentration (S.C), Mass Motiliy (M.M) and sperm abnormality percentage), respect of sperm concentration with body weight was (0.28). Obtained results agree with finding of **Poonia and Rao (1999)** who observed that body weight was highly and significantly correlated with body measuerments. And also agree with **Matsuzaki *et al.* (2001)** who showed that plasma testosterone level was positively correlated with age.

4.16. Correlation coefficients between age, body weight, body measurements, libido, semen characteristics and plasma testosterone levels in buffalo bulls

Results in table (23) showed that trend (which was found in cow bulls) was also observed between different buffalo bull body weights, ages, libido and dimensions, where correlation coefficient values between them were positively and highly ($P<0.01$) and varied between 0.541 (between age and D. B.T.C) to 0.986 (between, BL and both B.W). While it was only significant ($P<0.5$) but negatively correlated between sperm concentration% and age (-0.425) as well as between H.G and T.L (-0.295). Concerning relation between age, body weight, dimensions and reaction time (libido) and different semen quality studied trait as well as plasma testesterone level (T.L), they were found to be not significant and mostly negative and low correlated –0.011 (between. BL and P.L.S) to 0.343 (between buffalo bull age and S.V) (Table 23).

4.17. Correlation coefficients between libido, semen characteristics and plasma testosterone levels in cow bulls :

Correlation coefficients values between libido, semen characters and plasma testosterone levels in cow bulls was illustrated in table (24) showed that semen volume (S.V) had a significant ($P<0.05$) and positive correlation with inidividual motility (I.M) (0.320) While, mass motility was highly and significant ($P<0.01$) correlated with both individual motility (I.M.) (0.702) and P.L.S (0.688) but negatively (-0.332) with

Table (23): Correlation coefficients between body measurements, libido semen characteristics and plasma testosterone levels in buffalo bulls.

Traits	Age	B.W	H.G	B.L	F.L	P.W	D.B.T.C
B.W	0.917**						
H.G	0.934**	0.976**					
B.L	0.896**	0.986**	0.963**				
F.L	0.506**	0.632**	0.498**	0.618**			
P.W	0.786**	0.854**	0.800**	0.827**	0.872**		
D.B.T.C	0.541**	0.662**	0.576**	0.651**	0.715**	0.718**	
R.T	0.097	-0.168	-0.108	-0.089	-0.049	0.020	0.091
S.V	0.343	0.170	0.188	0.137	0.190	0.176	0.293
M.M	-0.369	-0.292	-0.323	-0.294	-0.256	-0.241	-0.224
I.M	-0.232	-0.152	-0.164	-0.141	-0.245	-0.243	-0.147
P.L.S	-0.202	-0.014	-0.055	-0.011	-0.057	-0.076	-0.052
S.C	-0.425*	-0.050	-0.099	-0.061	-0.282	-0.343	-0.104
Ma. A	0.081	-0.179	-0.096	-0.073	-0.211	-0.098	-0.372
Mi. A	0.140	-0.194	-0.126	-0.126	-0.129	-0.066	-0.189
T.L	-0.270	-0.258	-0.295*	-0.263	-0.122	-0.281	-0.280

Where = * ($P < 0.05$)

= ** ($P < 0.01$)

Table (24): Correlation coefficients between libido, semen characters and plasma testosterone levels in cow bulls.

Characters	R.T	S.V	M.M	I.M	P.L.S	S.C	Ma.A	Mi.A
R.T								
S.V	-0.028							
M.M	0.065	0.258						
I.M	-0.139	0.320*	0.702**					
P.L.S	-0.010	0.206	0.688**	0.870**				
S.C	0.204	0.107	0.066	0.214	0.152			
Ma. A	-0.003	-0.089	0.049	0.049	0.053	0.023		
Mi. A	-0.025	-0.113	-0.332*	-0.300*	-0.203	-0.199	0.010	
T.L	-0.171	0.322	0.289	0.075	0.245	-0.106	-0.035	-0.256

Where * = (P< 0.05)

**** = (P< 0.01)**

(Mi. A). The P.L.S trait showed highly and significantly (P<0.01) correlation with initial motility (0.870), while (Mi. A) showed significant (P< 0.01) but negatively correlation with initial motility (-0.300). Obtained results were sertifically logic because by increasing semen mass and initial advanced motility it was a criteria (Indication) for its good percentage of live sperms from one side and for its lower percent of abnormalities (significant and negative correlation between both traits and Mi.A) (Table, 24). Plasma testosterone level in cow bulls investigated had no specific trended and fluctuated between negative or positive, But no significant correlation coefficient values were obtained between testosterone hormone levels and different characteristics of semen quality studied (Table 24).

Obtained results agree with **Shangmugavel and Singh (2002)** about Mass motility (M.M) and percentage of live spermatozoa which was significantly and positively. And disagree with **Patel *et al.*, (2001)** who found that reaction time was significantly and positively correlated with semen volume.

4.18. Correlation coefficients between libido, semen characteristics and plasma testosterone levels in buffalo bulls :

Table (25) revealed correlation coefficient values between libido, semen characters and plasma testosterone levels in buffalo bulls.

Results showed a significantly (P<0.5) and negative correlation between RT and Sc (-0.446), but R.T was positively correlated with S.V (0.190). Also, showed positively correlation between M.M and I.M (0.715), PLS (0.615) (P<0.01) and with S.C (0.430) (P<0.05).

Table (25): Correlation coefficients between libido, semen characters and plasma testosterone level in buffalo bulls.

Characters	R.T	S.V	M.M	I.M	P.L.S	S.C	Ma.A	Mi.A
R.T								
S.V	0.190							
M.M	0.073	-0.042						
I.M	-0.157	0.238	0.715**					
P.L.S	-0.326	0.130	0.615**	0.875**				
S.C	-0.446*	-0.265	0.430*	0.587**	0.580**			
Ma.A	0.303	-0.277	-0.083	-0.210	-0.357	-0.289		
Mi.A	0.386	0.219	-0.391	-0.314	-0.313	-0.577**	0.169	
T.L	-0.095	-0.258	0.083	0.096	0.310	0.139	-0.114	-0.453

Where : * = (P< 0.05)

**** = (P< 0.01).**

While, I.M showed significant correlation (P<0.01) with PLS (0.875), S.C (0.587) and between PLS with S.C (0.580) positively and Mi.A showed significant but negative correlation (P<0.01) with S.C (-0.577). These results were also scientifically logic as previously mentioned in cow bulls.

Semen concentration (S.C) as one of the more important traits in semen quality was found to be positively and highly (P< 0.01) correlated with both I.M (0.587) and P.L.S (0.580) as well as with M.M (0.430) (P< 0.05) While, negatively correlated (-0.446) with RT (P< 0.05) (table 25).

No trend was observed between plasma testosterone hormone level in buffalo bulls and their different semen quality traits studied.

Obtained results agree with **Purohit *et al.* (1998)** who showed that libido score (R.T) was positively and significantly correlated (P<0.5) with semen volume (S.V). while semen volume was negatively correlated with other studied traits. And also agree with findings of **Javed *et al.*, (2000)** about testosterone in healthy bulls which showed low positively correlation with sperm concentration (r=0.223). While, disagree with findings of **Das and Tomer (1995) and Taha *et al.* (1984)** in Egyptian buffalo who found that reaction time (R.T) was positively correlated with sperm concentration (r = 0.99) in Egyptian buffalo.