



Breeding and non-breeding seasonal variability in physical parameters of semen with hormonal profile and biochemical constituents of seminal plasma in Damani bucks

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Breeding efficiency of Bucks is not similar throughout the year. Several factors may be responsible for this change in breeding potential. Season is one of the major influential factors. To assess the relationship of Total protein, P, Cl, Ca, K, Na and Testosterone level of seminal plasma with physical characteristics of semen of Damani bucks during breeding and non-breeding seasons. The same mature, 10 Damani bucks of about Nine months age were used in 04 weeks of breeding and 04 weeks of non-breeding seasons. Physical characteristics of fresh semen, gross motility and live/ dead ratio of spermatozoa were recorded. The seminal plasma was separated by centrifugation and stored at -20°C for further processing of Hormone and Biochemical constituents. The results indicated that the semen quality and quantity were significantly improved in breeding seasons compared to non-breeding season. There was positive correlation ($r^2=$) among Physical parameters, biochemical constituents and testosterone level. Sodium has significant positive correlation with ejaculatory volume while phosphorous has significant positive co-relation with sperm concentration. However, phosphorous concentration significantly decreased with increased in dead/abnormal spermatozoa concentration. The overall semen quality was found highly dependent upon the seminal plasma biochemical constituents and proteins.

Keywords: Biochemical constituents, Breeding / non-breeding seasons, Damani bucks, Semen Characteristics, Seminal plasma.

INTRODUCTION

Goat population in Pakistan is estimated about 72.2million, with milk production of 891 thousand tons and the meat production is 701 thousand tons. The enhancement in goat milk and meat production as a whole remained about 2.76% and 2.18% respectively during the last fiscal year. The total estimated rise in population of goat during financial year 2016-17 is 2.70% (Anonymous, 2016-17).

To ensure the increase in productivity the fertility index of the male requires complete understanding related to semen physical state, behaviour to the seminal characteristics including seminal plasma and spermatozoa quality viz quantity. The seminal plasma's biochemical constituents including proteins are crucial for spermatozoa Liveability, functioning (Assumpcao et al. 2005; Alencar et al. 2012) including provision to sperm with nutrition, metabolization and protection from proteinase inhibitors which assists in capacitation (Pesch et al. 2006; Bitto et al. 2007). Semen analysis is generally dependant on

assessment of sperm morphology, progressive motility, sperm concentration, liveability % age. Seminal plasma's cations like K, Na, Ca and Mg build up osmotic balance, while many trace elements are essential part of chief enzymes. Thus for assessment of fertility in male it is very much important to evaluate the seminal plasma for its biochemical quality. Fertility in human is dangerously affected by deviation in seminal plasma from the standard level of Zn, Cu, Ca and Mg (Cevik et al. 2007). The testosterone concentrations of plasma was found to differ significantly linking seasons being lower in spring compared to autumn (Amrane et al. 2013).

The main hormone of male is testosterone, dependable for male secondary characteristics (Seideman et al. 1982) and its rivulet into the blood enhances the libido, capacity of males to mate females (Guyton and Hall, 1997). The dissimilar sizes of testes among bucks bring wide-ranging testosterone levels therefore affect the level of libido and quality of sperm (Kridli et al. 2007). Seasonal influences were too reported to alter the

secretion of testosterone (Barkawi et al. 2006).

A positive correlation was reported between live spermatozoa percentage and elevated ejaculation frequency for increased Ca, Na and K concentration in plasma of semen while negatively correlated with P concentration (Rahman et al. 2000).

Positive correlation among Physical parameters, hormonal profile and biochemical constituent of plasma have been recognized in many breeds but little data is existed in Damani bucks particularly in reference to seasonal variation. Therefore a comprehensive study was conducted that deliberate to find out the facts regarding basic hormonal and biochemical constituents' profiles and further any association among the of semen's physical parameters with plasma's biochemical constituents and hormonal concentration in bucks of Damani breed. The obtained results will be helpful for conducting future breeding programs and provide the helpful knowledge for farmers to plan natural mating.

MATERIALS AND METHODS

The experimental animals

For the conduction of experiment a total 10 numbers of clinically normal reproductive tract and mature healthy Damani bucks of about 9 month age at the LR & Development Station, tehsil Paharpur, District DIKhan were selected as the experimental units. The experimental bucks were managed under homogeneous conditions.

Semen collection

Semen was collected once a week from the selected bucks at dawn for a total sum period of 8 weeks including 4 weeks during breeding (spring season) and non-breeding (Winter season), by using AV Method (Schaanbachar and Lunstra, 1977). The collected semen samples were maintained at 37°C in water bath and put into evaluation for qualitative and quantitative analysis.

Physical parameters

Graduated glass collection tube was used for collection that is helpful for immediate estimation of ejaculate volume and color by visual observation. Mass motility was determined by putting the fresh semen's tiny drop on a glass slide and examining under (40X) low magnification. Progressive motility percentage of individual collected semen sample was determined for grading the semen quality (Hulet and Ercanbrack, 1962). The sperm cell concentration of the ejaculate was calculated with the help of hemocytometer method (Bane, 1952).

Sperm cell concentration = $X/80 \times 400 \times 200 \times 10 =$ sperm /mm³.

The eosin nigrosine stain was used, for the differentiation of live and dead spermatozoa (Swanson and Beardon, 1951). A tally counter was used for determining the percentage of dead spermatozoa. A total

of 200 cells were counted and among these the stained cells percentage was recorded that showed the dead spermatozoa percentage.

$$\text{Dead Sperm \%} = \frac{\text{Total number of stained sperm counted}}{\text{Total number of sperms counted}} \times 100$$

The Nigrosine stain was used for the estimation of abnormal spermatozoa percentage (Ahmad et al. 1987) and examined by microscope. The abnormal spermatozoa percentage was calculated with the help of formula given below:

$$\text{Abnormal sperm (\%)} = \frac{\text{No. of abnormal sperm} \times 100}{\text{Total No. of sperm count}}$$

Determination of Semen Biochemical and hormonal profile.

With the help of centrifuge machine, the separation of seminal plasma from the collected semen samples was made at 3000x G for period of 20 minutes at room temperature and separated seminal plasma was kept at -20C. The analytical kit method (DRG, 2009) was used to detect the concentration of testosterone in plasma samples. Potassium (K), Sodium (Na), Calcium (Ca), Phosphorous (P) and Chlorine (Cl) were assayed by measuring through commercially available kits (Catunda et al. 2009)

RESULTS

Analysis of Seminal Plasma's Testosterone and Biochemical constituents

During the breeding season the Damani bucks showed the protein concentration ranging from 2.50 to 5.10 ng/ml with mean scale of 3.55ng/ml compared to 1.60 to 5.0ng/ml with mean value 3.377 ng/ml as mentioned in table 1.

Physical variables of Semen during the Non-Breeding and Breeding season

Statistical analysis of physical variables is presented in (Table 2). It reflects that during the Breeding season the values of sperm concentration (10⁶), motility %age, Volume (ml), abnormal sperm %age and dead sperm %age were 1.16±0.01, 77.50±0.71, 0.67±0.03, 12.17±0.21 and 6.8±0.25 respectively. In the season of Non-breeding the physical variables i.e. sperm concentration (10⁶), motility %age, Volume (ml), abnormal sperm %age and dead sperm %age were 0.86±0.02, 68.75±0.77, 0.34±0.01, 18.97±0.56 and 11.45±0.35 respectively.

In non-breeding season, correlation among seminal plasma's testosterone and biochemical constituents is presented in the (Table3). Sodium was highly significant (p<0.01) correlated to chlorine and non-significantly correlated to remaining constituents. Correlation of calcium was non-significant with chlorine, phosphorus and sodium. There was a negative correlation between Calcium and total protein and calcium was also non-significantly correlated with testosterone

Correlation of seminal plasma's Testosterone concentration and biochemical constituents in the breeding season is presented in (Table 4). There was a positive correlation between total protein and chlorine. There was a highly significant ($p < 0.01$) correlation of sodium with phosphorus and cl. And Na^+ correlation was non-significant with remaining constituents. Chlorine and Potassium showed highly significant ($p < 0.01$) correlation and a significant ($p < 0.05$) correlation is expressed between phosphorus and Chlorine.

Correlation among physical parameters of semen in the non-breeding period is expressed in (Table 5). Volume was positively correlated to motility percentage and dead sperm %age but non-significant negatively correlated to others. There was a negative correlation between Motility %age and sperm concentration while other parameters are non-significantly correlated with Motility %age.

Correlation with in semen's physical characteristics of in the breeding period is expressed in (Table 6). Volume was significantly ($p < 0.05$) correlated to motility but non-significant negatively related with all other observed parameters. For Motility % age correlation was only significant ($p < 0.05$) with dead sperm %age while non-significant with all remaining parameters.

Correlation between testosterone level and biochemical constituents of seminal plasma with physical parameters of semen during non-breeding season are shown in (Table 7). Ejaculatory volume was correlated positively with Sodium while Na^+ was negatively and non-significantly correlated to abnormal sperm percentage and sperm concentration. Motility percentage was non-significantly correlated with sodium. Correlation of spermatozoa concentration was significant to Phosphorus but P was highly negative significant ($p < 0.05$) to abnormal and dead spermatozoa percentage.

Correlation of plasma's testosterone and biochemical constituents with semen's physical parameters during breeding season is presented in (Table 8). Sperm concentration was non-significant positively correlated with T. protein but Total protein correlated to all other parameters non-significantly negative. Volume was non-significantly correlated to Na^+ . Sperm concentration correlation with Phosphorus was significantly ($p < 0.05$) but Phosphorus high significant ($p < 0.05$) but negatively correlated with abnormal spermatozoa and motility percentage.

Table 1: Results of seminal Plasma Biochemical constituents and Testosterone during Breeding and Non Breeding Season of Damani Buck

Parameters	Season	Max.	Min.	Mean	Mean SE	SD
T. Protein (g/dL)	Breeding season	5.10	2.50	3.5575	0.14316	0.90539
	Non Breeding season	5.00	1.60	3.3775	0.10018	0.63363
Sodium (mEq/l)	Breeding season	158.00	144.00	151.1750	0.50369	3.18560
	Non Breeding season	150.00	140.00	145.4500	0.40974	2.59141
Calcium (mg/dl)	Breeding season	16.80	12.60	14.5425	0.18211	1.15179
	Non Breeding season	18.00	10.80	14.1575	0.23931	1.51351
Potassium (mEq/l)	Breeding season	28.00	21.90	24.6025	0.25014	1.58203
	Non Breeding season	24.60	15.10	21.3700	0.26874	1.69965
Phosphorus (mg/dl)	Breeding season	14.10	9.20	11.6575	0.17777	1.12430
	Non Breeding season	12.40	8.90	10.6625	0.14723	0.93114
Chloride (mEq/l)	Breeding season	113.00	105.00	108.3750	0.31762	2.00879
	Non Breeding season	107.00	100.00	103.8250	0.28619	1.81005
Testosterone (ng/ml)	Breeding season	6.32	4.09	5.3840	0.08027	0.50769
	Non Breeding season	5.41	3.37	3.5528	0.06795	0.42972

Table 2: Statistical Analysis of Physical Variables of Semen from Damani bucks in Breeding and Non Breeding Season.

Parameters	Season	Max	Min	Mean	Mean SE	SD
Volume (ml)	Breeding Season	1.30	0.20	0.6788	0.03835	0.24255
	Non Breeding Season	0.60	0.20	0.3413	0.01539	0.09733
Motility %age	Breeding Season	85.00	70.00	77.5000	0.71611	4.52911
	Non Breeding Season	80.00	60.00	68.7500	0.77522	4.90290
Sperm conc.(10 ⁶)	Breeding Season	1.30	0.90	1.1625	0.01815	0.11477
	Non Breeding Season	1.20	0.60	0.8650	0.02194	0.13877
Dead sperm %age	Breeding Season	11.00	4.00	6.8250	0.25542	1.61543
	Non Breeding Season	15.00	6.00	11.4500	0.35255	2.22975
Abnormal Sperm% age	Breeding Season	15.00	9.00	12.1750	0.21747	1.37538
	Non Breeding Season	25.00	11.00	18.9750	0.56442	3.56973

Table 3: Correlation among seminal plasma's testosterone and biochemical constituents during Non- Breeding Season

	T.P (g/dL)	Na+ (mEq/l)	Ca+ (mg/dl)	K+ (mEq/l)	P (mg/dl)	Cl- (mEq/l)	Testosterone (ng/ml)
Protein (g/dL)	1	-0.066	-0.064	-0.073	0.050	-0.141	-0.142
		0.685	0.696	0.656	0.758	0.386	0.383
Sodium (mEq/l)	-0.066	1	0.264	0.036	0.119	0.569	-0.175
	0.685		0.100	0.827	0.466	0.000	0.281
Calcium (mg/dl)	-0.064	0.264	1	-0.161	0.390	0.071	-0.129
	0.696	0.100		0.322	0.013	0.663	0.429
Potassium (mEq/l)	-0.073	0.036	-0.161	1	-0.202	-0.086	0.352
	0.656	0.827	0.322		0.211	0.598	0.026
Phosphoru (mg/dl)	0.050	0.119	0.390	-0.202	1	-0.037	0.089
	0.758	0.466	0.013	0.211		0.818	0.586
Chlorine (mEq/l)	-0.141	0.569	0.071	-0.086	-0.037	1	-0.060
	0.386	0.000	0.663	0.598	0.818		0.713
Testosterone (ng/ml)	-0.142	-0.175	-0.129	0.352	0.089	-0.060	1
	0.383	0.281	0.429	0.026	0.586	0.713	

Lower values showed level of significance.

Upper values showed Pearson's correlation coefficient.

Highly significant = (p<0.01)= **

Significant = (p<0.05)= *

Table 4: Correlation of seminal plasma's Testosterone concentration and biochemical constituents in the breeding season

	T.P(g/dL)	Na ⁺ (mEq/l)	Ca ⁺⁺ (mg/dl)	K ⁺ (mEq/l)	P(mg/dl)	Cl ⁻ (mEq/l)	Testosterone (ng/ml)
Protein(g/dL)	1	0.183	0.183	-0.082	0.073	0.288	-0.161
		0.259	0.257	0.614	0.656	0.071	0.322
Sodium(mEq/l)	0.183	1	0.145	0.183	0.377	0.570	-0.022
	0.259		0.371	0.258	0.017	0.000	0.892
Calcium(mg/dl)	0.183	0.145	1	0.237	0.019	0.002	-0.107
	0.257	0.371		0.141	0.905	0.991	0.509
Potassium(mEq/l)	-0.082	0.183	0.237	1	-0.049	0.486	-0.164
	0.614	0.258	0.141		0.765	0.001	0.312
Phosphorus(mg/dl)	0.073	0.377	0.019	-0.049	1	0.324	0.017
	0.656	0.017	0.905	0.765		0.041	0.917
Chlorine(mEq/l)	0.288	0.570	0.002	0.486	0.324	1	-0.140
	0.071	0.000	0.991	0.001	0.041		0.390
Testosterone(ng/ml)	-0.161	-0.022	-0.107	-0.164	0.017	-0.140	1
	0.322	0.892	0.509	0.312	0.917	0.390	

Upper values indicated Pearson's correlation coefficient.

Lower values indicated level of significance.

Significant = (p<0.05)= *

Highly significant = (p<0.01)= **

Table 5: Correlation among physical parameters of semen in the non-breeding period

	Volume of Semen (ml)	Motile sperm %age	Spermatozoa \Concentration (10 ⁶)	Dead spermatozoa %age	Abnormal Spermatozoa %age
Volume (ml)	1	0.272	-0.128	0.137	-0.351
		0.089	0.432	0.400	0.026
Motility %age	0.272	1	-0.085	0.252	0.079
	0.089		0.603	0.117	0.629
Sperm Conc.(10 ⁶)	-0.128	-0.085	1	-0.387	-0.157
	0.432	0.603		0.014	0.333
Dead sperm %age	0.137	0.252	-0.387	1	0.040
	0.400	0.117	0.014		0.806
Abnormal sperm %age	-0.351	0.079	-0.157	0.040	1
	0.026	0.629	0.333	0.806	

Upper values indicated Pearson's correlation coefficient.

Lower values indicated level of significance.

Significant = (p<0.05)= *

Highly significant = (p<0.01)= **

Table 6: Correlation among physical parameters of semen in the breeding period

	Volume of Semen (ml)	Motile sperm %age	Spermatozoa Concentration (10 ⁶)	Dead spermatozoa %age	Abnormal spermatozoa %age
Volume (ml)	1	0.318	-0.025	0.154	-0.069
		0.046	0.879	0.343	0.671
Motility %age	0.318	1	-0.111	0.359	0.154
	0.046		0.495	0.023	0.342
Sperm Conc.(10 ⁶)	-0.025	-0.111	1	-0.105	-0.022
	0.879	0.495		0.517	0.891
Dead sperm %age	0.154	0.359	-0.105	1	-0.101
	0.343	0.023	0.517		0.534
Abnormal sperm %age	-0.069	0.154	-0.022	-0.101	1
	0.671	0.342	0.891	0.534	

Upper values indicated Pearson's correlation coefficient.

Lower values indicated level of significance.

Significant = (p<0.05)= *

Highly significant = (p<0.01)= **

Table 7: Correlation between testosterone level and biochemical constituents of seminal plasma with physical parameters of semen during non-breeding season

	Sperm Conc. (10 ⁶)	Motility %age	Volume (ml)	Abnormal Sperm %age	Dead sperm %age
T. P (g/dl)	0.222	0.139	0.116	-0.020	0.157
	0.169	0.391	0.474	0.904	0.332
Na (mEq/L)	-0.148	0.126	0.011	-0.087	0.097
	0.363	0.438	0.947	0.592	0.551
Ca (mg/dL)	-0.085	-0.054	0.129	-0.288	-0.263
	0.600	0.741	0.428	0.071	0.101
Potassium (mEq/l)	0.029	-0.038	-0.299	0.149	0.016
	0.858	0.814	0.061	0.360	0.923
Phosphorus (mg/dl)	0.291	-0.241	-0.158	-0.479	-0.439
	0.068	0.134	0.330	0.002	0.005
Chlorine (mEq/l)	-0.301	0.191	0.042	-0.116	0.217
	0.059	0.237	0.797	0.477	0.179
Testosterone (ng/ml)	0.281	0.033	-0.035	-0.120	-0.183
	0.079	0.841	0.830	0.462	0.258

Upper values indicated Pearson's correlation coefficient.

Lower values indicated level of significance.

Significant = (p<0.05)= *

Highly significant = (p<0.01)= **

Table 8: Correlation between testosterone level and biochemical constituents of seminal plasma with physical parameters of semen during breeding season

	Sperm Conc. (10 ⁶)	Motility %age	Volume (ml)	Abnormal Sperm %age	Dead sperm %age
T. P (g/dl)	0.145	-0.098	-0.065	-0.026	-0.092
	0.373	0.545	0.689	0.875	0.572
Na (mEq/L)	0.166	-0.031	-0.270	-0.118	0.036
	0.307	0.849	0.091	0.467	0.825
Ca (mg/dL)	0.204	0.038	0.026	0.036	-0.143
	0.206	0.815	0.874	0.827	0.378
Potassium (mEq/l)	0.102	0.182	-0.124	0.294	-0.146
	0.530	0.262	0.445	0.065	0.368
Phosphorus (mg/dl)	0.335	-0.351	-0.196	-0.396	0.127
	0.035	0.026	0.226	0.011	0.435
Chlorine (mEq/l)	0.329	-0.049	-0.307	0.096	0.052
	0.038	0.762	0.054	0.554	0.748
Testosterone (ng/ml)	-0.301	0.098	0.280	0.081	0.437
	0.060	0.549	0.080	0.620	0.005

Upper values indicated Pearson's correlation coefficient.

Lower values indicated level of significance.

Significant = (p<0.05)= *

Highly significant = (p<0.01)= **

DISCUSSION

The current study was aimed to investigate 1st time ever, the reproductive indices of Damani bucks with reference to Breeding and Non Breeding seasons. The Physical parameters (increase in ejaculatory volume, sperm concentration, motility percentage and decrease in the abnormal and dead spermatozoa percentage), Bio-chemical constituents and hormonal profile of semen, in general, showed higher quality during the Breeding season when compared to Non-Breeding season. The recorded average per ejaculatory volume in Non-Breeding Season is ± 0.34 ml, which is in agreement with the findings of (Rachmawati et al. 2011), who worked with different breeds of bucks and recorded their seminal indices. In February and March (Breeding season) volume/ejaculate was increased to ± 0.67 ml, an agreement with (Mia et al. 2013). These ejaculatory volume results are the consistency of results reported for by buck semen (Roca et al. 1992a; Singh and Purbey, 1994 and Karagiannidis et al. 2000). Barkawi et al. (2006) recorded elevated volumes/ ejaculate and (Webb et al. 2004). Talebi et al. (2009) investigated the higher volumes of the ejaculates in long day seasons while minimum in short day seasons. Various trends setting in reference to seasonality in ejaculate volumes were reported (Karagiannidis et al. 2000; Al-Ghalban et al. 2004)

Albumin and globulin are major seminal plasma proteins (Zedda et al. 1996) and are characterized to constitute the seminal plasma's amphoteric property. The reduced proportion of protein in the semen plasma is attributed to the reduced buffering capacity and thus semen quality. The study depicted that total protein value was higher (3.5 ± 0.14 g/dl) during spring season than winter season (3.3 ± 0.10 g/dl), with an overall mean value of 3.47 ± 0.09 g/dl. These findings differed from earlier results, (Santos et al. 1998; Aguiar et al. 2013) showing a higher pattern of Total proteins crossbred bucks.

The considerable seasonal difference in semen volume for Damani bucks, observed in current study is in accordance with the earlier studies (Tuli and Holtz, 1992) and (Delgadillo and Chemineau, 1992) who reported for the other goat breeds under different environmental circumstances. Soderquist et al. (1992) reported that these variations in ejaculate volume might also be due to variation in reproductive health status of bucks, genetics, frequency of collection, age of bucks, nutrition, pooled volume, management and season. Also dissimilar environmental temperature and light in various seasons may be dependable for variation of ejaculatory volume.

Motility percentage was superior during breeding period of the year as 77.50 ± 0.71 than the non-breeding season $68.75\pm 0.77\%$. These findings represented accordance to the earlier reported results, (Ahmad et al. 1997; Karagiannidis et al. 2000) and (Talebi et al. 2009) for Markhoz goats. Progressive motility was increased in breeding season than the non-breeding (Barkawi et al. 2006). Whereas, Talebi et al. (2009) reported significant

reduction in progressive motility %age ($P < 0.05$) in the winter and spring but in autumn months better progressive motile sperm %age was observed (Kridli et al. 2007). However, Ahmad et al. (1997) denied of any significantly effect of season on the sperm motility.

In current study, concentration of sperm was greater in breeding months when compared to the non-breeding months. This is in accordance with the findings (Kridli et al. 2007), found an increased production of spermatozoa with maximum enhancement of sperm concentrations in breeding months. In the Gorno Altai, Webb et al. (2004) reported increased concentration of sperm especially in the early spring and winter season. Talebi et al. (2009); Al-Ghalban et al. (2004) reported the lowered concentration of sperm in the autumn whereas, increased concentrations during the seasons of summer, winter and spring. The observed inclination is in accordance with earlier reports (Karagiannidis et al. 2000). Mathevon et al. (1998) reported better semen evaluations in winter and spring when compared to summer season. Ciereszko et al. (2000) also found lowered spermatozoa production in the seasons of winter and autumn and an increase during the summer.

The study showed higher dead sperm % age (11.45 ± 0.35) in winter season than spring season (6.82 ± 0.25). The findings are not in agreement with (Ahmad et al. 1997; Barkawi et al. 2006 and Talebi et al, (2009) who found higher % age of dead sperm during both winter and spring.

The study presented that the abnormal sperm percentage was higher (18.97 ± 0.56) during non-breeding than breeding season (12.17 ± 0.21). This is in accordance with the earlier reported results (Roca et al. 1992); Perez and Mateos, (1994) for both Verata and Murciano-Granadina breed bucks. Karagiannidis et al. (2000); Al Ghalban et al. (2004); Kridli et al. (2007) and Talebi et al. (2009) supported the present study for non-breeding but did not agree for breeding season. In contrast, during rainy or summer seasons Chemineau et al. (1991) found no enhancement in level of abnormal sperm percentage. Whereas, Greyling and Grobbelaar, (1983) and Mittal and Ghosh, (1985) found no seasonal variations regarding the occurrence of abnormal sperm in Parbatsar and tropical Creole bucks.

A well-defined seasonal pattern of testosterone concentration was displayed during the current work. Low concentration was observed during non-breeding while in breeding season high concentration of seminal plasma was recorded. Delgadillo et al. (1999); Barkawi et al. (2006) and Talebi et al. (2009) supported the study reporting increased levels of testosterone in breeding season, also explained the hypothesis that every breed's buck have different season of mating. Sexual stimulus has been established to increase the testosterone secretion, (Perez and Mateos, 1994). Delgadillo and Chemineau, (1992) and seasonal effect on concentration of testosterone in serum was recorded significant, (Talebi et

al. 2009) and attributed these variations to geographic, genetic, environmental and climatic factors.

K, Cl, P, Ca, Na and TP of seminal plasma, upon which sperm function is greatly dependent (Setchell and Brooks, 1988; Hamamah and Gatti, 1998; Machal et al. 2002; Mosafari et al. 2005 and Cevik et al, 2007) were investigated in the present study. The sodium concentrations were found higher (151.17 ± 3.18 mEq/l) during breeding season than Non-Breeding season (145.45 ± 2.59 mEq/l). The finding was supported by the earlier findings (Iheukwumere et al. 2008).

Potassium, the natural metabolic inhibitor, the increased K concentration in seminal plasma leads to decreased sperm metabolism, thus resulting in decreased sperm motility (Massanyi et al. 2003). In current study, the Potassium was lesser (21.37 ± 0.26) during winter season than spring (24.60 ± 0.25 mEq/l). This concentration was smaller than the findings (Iheukwumere et al. 2008).

Ca⁺ is recognized as an indicator of seminal release (Wong 2001), playing vital role in spermatogenesis, excluding key role in sperm motility and simultaneously thought fundamental cation found approximately in every enzymatic process (Jobim et al. 2004; Wong et al. 2001). During the current study, a Non-significant Calcium levels difference was observed during winter and spring seasons. The overall recorded mean values were 14.35 ± 0.15 mg/dl. The results are in agreement with earlier findings (Aguiar et al. 2013) and greater than the findings of (Hafez et al. 1987) (6 mg/dl) and (Iheukwumere et al. 2008) (8.20 ± 2.1 mg/dl).

Chlorine has a manifold functions in hemopoieses, iron absorption, oxidation reduction process and various enzymes activities (Rous and Jelinek, 2000). In the current experiment Cl concentrations were higher (108.37 ± 2.01 mEq/l) in breeding season when compared to non-breeding season (103.82 ± 1.81 mEq/l).

The overall average of P was found to be 11.16 ± 0.12 mg/dl, however, this concentration was lower (10.66 ± 0.14 mg/dl) during winter season compared to spring season (11.65 ± 0.17 mg/dl). The results are in accordance with the early recordings (Aguiar et al. 2013).

CONCLUSION

It is concluded from the said research that as physical and biochemical parameters of semen and plasma are significantly different. Hence this study supported that the reproductive efficiency of Damani bucks is not same throughout the year. A number of factors may be responsible for this change in breeding potential. Season is one of the major factors having sub-factors as photoperiod, humidity, temperature and availability of fodder as well. The results indicated that the semen quality and quantity were significantly improved in breeding seasons compared to non-breeding season. There was positive correlation ($r^2=$) among Physical parameters, biochemical constituents and testosterone level. The overall semen quality was found highly

dependent upon the seminal plasma biochemical constituents and proteins. Further research is deemed to investigate more on the responsible factors and fertility trails of semen as well.

CONFLICT OF INTEREST

The authors declared that there is no any conflict of interest.

AUTHOR CONTRIBUTIONS

MIM and HJ and GJ designed experiments and wrote the manuscript. SU and FR analyzed the samples and data. AR and SAR reviewed the manuscript. ID, AT and MZ helped in planning and execution of the experiment.

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