



Correlation between certain physical and biochemical characteristics of yak semen

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Reproduction plays a vital role in augmenting production and productivity of all animals. Effective utilization of artificial insemination technology to enhance the reproductive efficiency of yak species, knowledge of physio-biochemical characteristic of semen is highly essential. Since there is no relevant information about biochemical characteristics of yak semen in India, the present study was designed to study the physical and biochemical profile of yak semen and to find out the correlation between them.

Semen was collected from 6 healthy yak bulls twice in a week using a standard artificial vagina. Immediately after collection, semen samples were evaluated for different physical characteristics, viz. colour, ejaculate volume, mass activity, initial sperm motility, sperm concentration and pH following standard techniques. Seminal plasma were separated and stored at -20°C for further biochemical evaluation by centrifuging the semen at 3000 rpm for 15 min. The profile of initial fructose content, total protein, total cholesterol, phospholipid, calcium and inorganic phosphorus in seminal plasma were analyzed using diagnostic kits in the double beam UV-VIS spectrophotometer. Data were analysed as per Snedecor and Cochran (1994).

In the present study, significant correlation of different physical and biochemical parameters were found amongst the yak bulls. The mean values for different physio-biochemical parameters are presented in Table 1. Statistical analysis revealed that the different physical characteristics of yak semen namely ejaculate volume ($P<0.01$), initial sperm motility ($P<0.05$), sperm concentration ($P<0.01$) and different biochemical constituents namely, initial fructose content,

Table 1. Physio-biochemical characteristics of yak semen (n=60)

Parameters	Characteristics
Colour	Creamy white
Ejaculate volume (ml)	3.23 ± 0.15 (0.9–5.3)
Mass activity	3.22^+ ($2^+ - 4^+$)
Initial sperm motility (%)	68.58 ± 0.24 (60–80)
sperm concentration ($\times 10^6$)	1235.18 ± 51.74 (983–1474)
pH	6.48 ± 0.03 (6.1–6.9)
Initial fructose content (mg%)	421.02 ± 0.42 (412–429)
Total protein (g%)	8.38 ± 0.22 (4.58–12.8)
Total cholesterol (mg%)	56.55 ± 0.32 (52.23–67.23)
Phospholipid (mg%)	337.41 ± 0.34 (120.15–667.08)
Calcium (mg%)	22.92 ± 0.27 (11.36–25.7)
Inorganic phosphorus (mg%)	6.11 ± 0.09 (4.08–7.15)

Values in the parenthesis indicate range.

total protein concentration, phospholipids and calcium differ significantly ($P<0.01$) between the yak bulls. The bulls also differed significantly ($P<0.05$) in respect of total cholesterol and inorganic phosphorus content. The data obtained for various physical parameters of yak semen was in accordance with the earlier reported by Sarkar *et al.* (2009). Significant correlation between physical and biochemical parameters of yak bull semen are found in the present study. The initial fructose content of yak bull semen revealed significant ($P<0.01$) positive correlation with ejaculate volume and initial sperm motility; however, a negative ($P<0.01$) correlation was observed with sperm concentration. The present finding is in agreement with the earlier report of Roca *et al.* (1993). This could be attributed to increase in initial fructose content under the influence of androgen with spermatozoa output since seminal fructose from the seminal vesicle mainly depends on leydig cell function and androgen production (Patil *et al.* 2001). The total protein content of yak bull seminal plasma revealed a positive ($P<0.05$) correlation with initial sperm motility; however, a negative ($P<0.01$) correlation with ejaculate volume sperm concentration was also observed. Similar finding was also reported by Kulkarni *et al.* (1996) in Holstein-Friesian, Jersey

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and crossbred bulls. The positive correlation with initial sperm motility might be due to the beneficial effects of seminal plasma protein that improves the sperm motility as reported by Gundogan (2006). The cholesterol content showed a significant ($P<0.01$) positive correlation with ejaculate volume and sperm concentration and a negative ($P<0.01$) correlation with initial sperm motility. The finding was in accordance with the reported values of Shelke and Dhami (2002) in bull seminal plasma. Higher cholesterol level in seminal plasma would have a destabilizing effect on the spermatozoa leading to reduction of motile spermatozoa, since cholesterol played a crucial role in stabilization of membrane structure of spermatozoa (Gundogan 2006). The phospholipids content yak bull seminal plasma showed a significant ($P<0.01$) positive correlation with ejaculate volume and sperm concentration, and a negative ($P<0.01$) correlation with initial sperm motility. Phospholipids are known to be the important structural components of plasma membrane of spermatozoa; hence, it may influence the quality of semen. Calcium revealed a positive ($P<0.05$) correlation with ejaculate volume and sperm concentration; however, showed a nonsignificant negative correlation with initial sperm motility in the present study. A positive correlation of calcium with ejaculate volume was earlier recorded by Das (2007) in Beetal and crossbred bucks. In the present experiment, inorganic phosphorus revealed a significant ($P<0.01$) positive correlation with ejaculate volume and sperm concentration and a negative correlation with initial sperm motility. Similar findings were reported by Abdou *et al.* (1977) in both Holstein- Friesian and Murrah bulls.

SUMMARY

Correlation between physical and biochemical characteristics of semen were evaluated from 6 genetically superior yak bulls. The various biochemical constituents of yak semen, viz. initial fructose content, total cholesterol, phospholipids, inorganic phosphorus of yak semen were found to be positively correlated with ejaculate volume and sperm concentration and negatively correlated with initial sperm motility. Significant positive correlation also existed between calcium with ejaculate volume and sperm

concentration. However total protein content of seminal plasma were positively correlated with initial sperm motility and negatively correlated with ejaculate volume and sperm concentration of yak semen.

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