SOME ASPECTS OF THE COMPOSITION OF BUFFALO SEMEN

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An earlier report from this laboratory (Banerjee & Ganguli, 1971) was concerned with the electrophoretic and gel filtration behaviour of seminal plasma proteins in Zebu and buffalo bull semen. The chemical composition of Zebu semen has been reported by Mann (1964) and that of buffalo semen by Roy, Karnik, Lukuture, Bhattacharya & Bhattacharya (1950) and Roy, Pandey & Rawat (1960). The present work was undertaken in order to evaluate the nature of the composition of semen from Zebu and buffalo bulls maintained in our Institute's herd.

Semen samples were collected once a week, using the artificial vagina technique described by Walton (1945). Seminal plasma was separated by centrifuging whole semen at 2000 rev/min for 20 min.

Sperm counts were carried out by the method of Herman & Madden (1953). Fructose was estimated by the method of Roe (1934). Sialic acid, citric acid and ascorbic acid were determined by the methods described by Warren (1959), International Dairy Federation (1967) and Gyorgy (1950), respectively. The level of DNA was measured by the methods of Burton (1956) and Summerhill & Olds (1961). Determination of total nitrogen, non-protein nitrogen, calcium, magnesium and phosphorus were carried out according to the methods described by Hawk, Oser & Summerson (1947).

The sperm density of Zebu bull semen ($1091.8 \pm 92.9 \times 10^6/\text{ml}$) was markedly higher than that of buffalo bull semen ($578.5 \pm 97.8 \times 10^6/\text{ml}$). Wide variations in sperm concentration were observed between samples and also from day to day. Mahmoud (1952) also reported wide variations in the sperm concentrations in Egyptian buffalo semen.

Levels of the constituents measured in whole semen were generally higher in Zebu bull semen than in buffalo bull semen, though the DNA concentration was slightly higher in buffalo semen. Sialic acid and non-protein nitrogen concentrations in Zebu bull semen were higher than in buffalo bull semen. In both species, whole semen contained more of these constituents than did seminal plasma. The level of citric acid was higher in Zebu bull semen, but in both species, the seminal plasma contained slightly higher concentrations of this constituent than the whole semen. Ehlers, Flerchinger & Erb (1953) also observed a similar phenomenon in Zebu bull semen. The present study indicated a lower level of ascorbic acid in buffalo bull semen than in Zebu bull semen. Both buffalo and Zebu bull semen had similar levels of inorganic phosphorus, calcium and magnesium (Table 1).

Table 1. Levels of certain constituents in whole semen and seminal plasma of Murrah buffalo and Zebu bulls

Nature of sample	Source of semen	Fructose	Total nitrogen	Total phosphorus	DNA	Sialic acid	Citric acid	Ascorbic acid	Non-protein nitrogen	Inorganic phosphorus	Calcium	Magnesium
Whole semen	Buffalo	623.8 ± 83.6 (10)*	684.1 ± 39.4 (5)	60.1 ± 3.5 (5)	420.3 ± 15.5 (5)	133.2 ± 4.3 (5)	441.8 ± 31.9 (5)	6.2 ± 0.8 (5)	136.1 ± 10.1 (5)	5.4 ± 1.2 (6)	—	—
	Zebu	780.6 ± 66.2 (16)	1103.8 ± 190.6 (6)	108.6 ± 16.3 (5)	401.9 ± 64.7 (6)	247.6 ± 26.4 (9)	531.3 ± 73.4 (9)	9.9 ± 2.7 (7)	205.2 ± 49.3 (6)	4.8 ± 0.5 (6)	—	—
Seminal plasma	Buffalo	—	—	—	—	103.3 ± 7.3 (5)	444.9 ± 17.4 (5)	3.9 ± 0.5 (5)	88.7 ± 6.1 (5)	4.6 ± 0.3 (5)	44.4 ± 2.4 (5)	4.3 ± 0.04 (5)
	Zebu	—	—	—	—	214.9 ± 27.5 (5)	576.9 ± 58.6 (8)	13.2 ± 3.3 (6)	99.9 ± 54.6 (5)	5.0 ± 0.2 (5)	43.5 ± 2.8 (5)	4.19 ± 0.8 (5)

The results are expressed as mg/100 ml ± S.E.M.
 * The figures in parentheses are the numbers of samples analysed.

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REFERENCES

- BANERJEE, A. K. & GANGULI, N. C. (1971) Differentiation of semen from *Bos bubalus* and *Bos taurus indicus* by starch gel electrophoresis. *J. Anim. Sci.* **32**, 1212.
- BURTON, K. (1956) A study of the conditions and mechanism of the diphenylamine reaction for the colorimetric estimation of deoxyribonucleic acid. *Biochem. J.* **62**, 315.
- EHLERS, M. H., FLERCHINGER, F. H. & ERB, R. E. (1953) Initial level of fructose and citric acid in bull semen as related to fertility. *J. Dairy Sci.* **36**, 1020.
- GYORGY, P. (1950) *Vitamin methods*, Vol. 1. Academic Press, New York.
- HAWK, P. B., OSER, B. L. & SUMMERSON, W. H. (1947) *Practical physiological chemistry*. Blakiston, London.
- HERMAN, H. A. & MADDEN, F. W. (1953) *The artificial insemination of dairy cattle. A hand-book and laboratory manual*. Lucus Brothers, Columbia.
- INTERNATIONAL DAIRY FEDERATION (1967) Determination of the citric acid content of cheese and processed cheese products. *Bull. int. Dairy Fed.* **34** A.
- MAHMOUD, I. N. (1952) Some characteristics of semen of Egyptian buffaloes. *Bull. Fac. Agric. Ain Shams Univ.* No. 15.
- MANN, T. (1964) *The biochemistry of semen and of the male reproductive tract*. Methuen, London.
- ROE, J. H. (1934) A colorimetric method for the determination of fructose in blood and urine. *J. biol. Chem.* **107**, 15.
- ROY, A., KARNIK, Y. R., LUKUTURE, S. N., BHATTACHARYA, S. & BHATTACHARYA, P. (1950) Studies on the reducing substances in semen. Part I. Concentration of fructose, ascorbic acid and TRS in ejaculated semen of buffalo bull, ram, buck and cock. *Indian J. Dairy Sci.* **3**, 42.
- ROY, A., PANDEY, M. D. & RAWAT, J. S. (1960) Composition of bovine semen. *Indian J. Dairy Sci.* **13**, 112.
- SUMMERHILL, W. R., JR & OLDS, D. (1961) Levels of deoxyribonucleic acid in bovine spermatozoa and their relationship to fertility. *J. Dairy Sci.* **44**, 548.
- WALTON, A. (1945) *The technique of artificial insemination*, 3rd edn. Holborn Surgical Instrument Co., London.
- WARREN, L. (1959) The thiobarbituric acid assay of sialic acid. *J. biol. Chem.* **234**, 1917.