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Assessing the Uterine Involution and Postpartum Ovarian Activity of Indigenous Zebu Cattle in Sri Lanka

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ABSTRACT. An experiment in a village of the dry zone of Sri Lanka was undertaken to study the postpartum uterine involution and ovarian activity in indigenous Zebu cattle. The animals in the village were managed on natural pasture on communal grazing lands and cows were suckled by calves once a day until 2–3 months postpartum and ad–libitum suckling thereafter. Ten postpartum cows were clinically examined and blood samples for plasma progesterone measurement were obtained at weekly intervals. Blood samples were centrifuged at 3000 rpm for ten minutes and plasma was separated and stored at –20 C until assayed for plasma progesterone. The concentration of progesterone was determined by Radioimmunoassay technique using antibody coated tubes and progesterone ^{125}I tracer. The mean lengths in days from calving to completion of uterine involution and to first observed oestrus were 24.1 ± 4.7 and 46.50 ± 39.50, respectively. The mean length from calving to conception was 63.0 ± 55.07 days. The results showed that indigenous zebu cattle managed extensively and subjected to once a day suckling during early postpartum period resumes ovarian activity within 60 days post–calving. As there may exist wide variation in management systems in the different parts of the dry zone, trials have been replicated in several locations to determine the interaction between varying management practices and the above parameters of reproduction.

INTRODUCTION

Ninety two percent of 1.7 million cattle in Sri Lanka are indigenous type which are poor producers scattered mainly in the dry zone of Sri

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Lanka (Livestock Statistics, 1986/87). At present, it provides 23% of the total milk collection by the organized milk collecting network (Soni *et. al.*, 1991) and provides major portion of the meat supply at the present level of consumption (Rajaguru, 1986). More importantly it provides income, food, and farm power to the rural poor.

In rural Sri Lanka, cattle farming is a "low – cost" production system which has been the most sustainable agricultural production system in the dry zone as the crop cultivation is vulnerable to frequent droughts in the dry zone. Rural farmer raises them as large herds ranging from 10 – 200 animals per herd grazing on communal grazing lands which could be a catchment area of a tank, abundant tank bed or shrub jungle with provision of night paddocking near the farmers dwellings. There is no supplementary feeding of concentrates or any other feeding materials (Ozawa *et. al.*, 1978; Abeygunawardena *et. al.*, 1990). The animals experience very few diseases which require urgent veterinary care and they are protected from endemic diseases through regular vaccination which is provided by the state veterinary service. The family unit usually provides all required labour. The cattle farming usually provides annual income on the average of Rs. 36000.00 – 48000.00 depending on the size of the herd in which a substantial portion comes from selling animals for meat (Abeygunawardena *et. al.*, 1990).

This sustainable system is facing some restrictions as the communal grazing lands are becoming scarce in the dry zone and as a result already a conflict between the crops and livestock has emerged. It appears that keeping large herds would not be possible in the future due to intense competition for the communal grazing land by man for cultivation. Thus, this much needed sustainable rural industry depends on the ability of the sector to reduce the herd size without affecting the productivity per unit. Working with that premise since early 50's, efforts have been made to upgrade the local zebu cattle by crossing with exotic Bos indicus animals (Wijeratne, 1970; Buvanendran, 1975). Inspite of strong efforts of the public sector to upgrade the indigenous zebu cattle with exotic zebu cattle, the results fell far below the level of expectation. Lack of information on the reproductive pattern of indigenous zebu cattle and the management system at large would have undoubtedly contributed partly to the failure to achieve the expected results.

Hitherto studies on reproductive pattern and management systems were limited to field surveys. Very little detailed information is available

on the production characters and associated biological features. In this context the study by Mahadevan, 1953 and Ozawa *et. al.*, 1978 were noteworthy. The limited field surveys reported that, calving was seasonal and that calving rate of indigenous zebu cattle was in the range of 50 – 85% with the average calving interval varying between 390 to 730 days. Majority of calving occur during the October to February period, which is the period following North – East monsoon rains (Ozawa *et. al.*, 1978; Abeygunawardena *et. al.*, 1990).

This study is a part of an on – going large scale project aimed at assessing the productivity, reproductive efficiency and health status of zebu cattle in Sri Lanka. The objective is to characterize the postpartum involution of the uterus and postpartum ovarian activity of indigenous zebu cattle in traditional management systems.

MATERIALS AND METHODS

Animals

The experiment was conducted during the period from April to December 1990, in a village called Walpaluwa in Puttlam district, in the dry zone of Sri Lanka. The average environmental temperature was 28.3 C (Economic and Social Statistics of Sri Lanka, 1991) and the average rainfall was 1397.8 mm (Department of Meteorology, 1991 – 1992). The rainfall was seasonal with major precipitation occurring during the North – East monsoon which occurs from October through February.

The animals were managed extensively with minimum inputs from the farmers. They grazed for about ten hours per day on natural pasture on communal grazing lands located few miles away from the village. Night paddocks were provided near the farmers dwellings. Animals were bred naturally through random mating with herd bulls. Suckling stimulus by calves was needed for milk ejection. Up to 2 – 3 months postpartum, the calves were allowed only once a day suckling period and they were kept at the farmers dwellings in a small shed and mothers following milking were taken to communal grazing land. After about 2 – 3 months the grown calves were allowed to go with mothers for grazing. On return in the evening the calves were separated from the mothers and kept in a small shed.

Rectal examination and blood sampling

Ten indigenous pluriparous cows within 1 – 2 weeks postpartum with known calving date, were selected for the study. Rectal examination was performed at two week intervals. During the rectal examinations the size and the palpable structures of ovaries and the diameter and length of the uterine horns, uterus, cervix and the position of the reproductive tract in relation to pelvic bones were determined. Blood sampling for plasma progesterone estimation was commenced at 1 – 2 weeks postpartum and continued at weekly intervals. Blood was drawn from jugular vein into heparinized vacutainer (Becton Dickinson Vacutainer Systems Europe, England). Blood was centrifuged within one hour of collection at 3000 rpm for ten minutes and plasma was separated and stored at – 20 C. Blood sampling was continued at the same frequency until the animals were found pregnant. The farmer was given a simple record sheet and was trained to observe for oestrous signs and make entries accordingly.

Plasma progesterone assay

Plasma progesterone was quantified by radioimmunoassay technique using antibody coated tubes and progesterone – ^{125}I as a tracer supplied by Joint division of FAO/IAEA in Vienna under the research contract SRL/5108/RB/. The assay was performed as described in the IAEA manual (1984 and 1991).

One hundred microliter of standards prepared in plasma at the concentrations of 0.0, 0.1, 0.5, 2.0, 5.0, 10.0 and 20.0 ng per millilitre, quality controls (low, medium and high) and unknown samples were added to labelled antibody coated polypropylene tubes (Joint FAO/IAEA Programme, Vienna, Austria). Within five minutes of adding the standards and unknown samples, one millilitre of progesterone – ^{125}I was added to each tube. These tubes were incubated overnight in an incubator at 4 C. Using a logit – log graph paper, standard curve was constructed. Progesterone concentrations in unknown samples and quality control samples were approximated from the graph. The sensitivity was 0.1 ng/ml and the intra and inter – assay coefficient of variations were 9.7% and 13.66%, respectively.

RESULTS

The involution of the uterus as measured by the time taken to reach the uterus to non – pregnant size, position and consistency was completed by day 24.1 ± 4.7 (range – 18 to 34 days). The ovaries were very small with approximate dimensions of 13.8 mm in length, 9.9 mm in width and 7.1 mm in height. The follicular development was hardly detectable and the palpation of corpus luteum was possible only 61.54% times when rectal findings were corroborated with plasma progesterone data.

The mean length in days for calving to first observed oestrus was 46.50 ± 39.50 days and the mean length of calving to conception was 63.0 ± 55.07 days. In three animals the first progesterone elevation occurred 8 – 16 days prior to first visible oestrus. In another five animals the first elevation of progesterone preceded visible oestrous signs. Seven animals conceived at the first oestrus and one animal conceived at the second oestrus. One animal had gone to anoestrus following visual oestrus on 27 days postpartum. Another animal was excluded from the study as the animal became uncontrollable for regular blood collection. Seventy eight percent of the animals showed first oestrus within 60 days postpartum and 75% of the animals conceived within 60 days.

DISCUSSION

The animals in the study group showed rapid uterine involution which was almost completed on the average within 24 days postpartum and it is relatively shorter than those reported for other type of cattle and buffaloes in Sri Lanka as well as in other countries. The postpartum uterus approaches its normal non – pregnant size by 25 – 47 days for temperate dairy cows and 37 – 56 days for suckling beef cows (Morrow *et. al.*, 1966). In tropical cattle found in other regions of the world, uterine involution was reported to be completed within 30 – 40 days postpartum (Galina *et. al.*, 1989). The time taken for the completion of uterine involution in Friesian, Jersey and Ayrshire animals reared in Sri Lanka were reported as 26.6, 27.2 and 47.2 days, respectively (Peiris, *et. al.*, 1982). In indigenous buffaloes in Sri Lanka the uterine involution period was reported to be 30 days (Perera *et. al.*, 1987). In suckling swamp buffaloes in Malaysia the uterine involution was reported to be completed by 28 days postpartum (Jainudeen *et. al.*,

1982) and in hand-milked river buffaloes in Egypt this was completed by 45 days (El-Fouly *et. al.*, 1976b). The difference from our study and others could be due to differences in criteria used for assessing the uterine involution or climatic and management factors which influence the involution process. For example Perera *et. al.*, (1987) found significant effect of the month of calving on uterine involution. The rapid involution in Lankan zebu cattle may be due to their relatively small size and also presumedly due to suckling stimulus by the calves. The suckling stimulus by the calf and the stimulus of milking were shown to be stimulatory to uterine involution (Wagner and Hansel, 1969).

The ovaries of the animals in the study group was relatively small 13.8 x 9.9 x 7.1 mm compared to the ovaries of the temperate cattle 25.1 x 18.4 x 15.3 mm (Settergren, 1964) and river type buffaloes 19.2 x 14.6 x 13 mm (Danell, 1987). It was reported that, in general the ovaries of zebu cattle were relatively smaller than those of temperate cattle (Galina *et. al.*, 1989). As the ovaries were small, it was relatively difficult to approximate follicular development rectally. Further, the rectal examinations were done at relatively longer intervals and hence it was difficult to follow the growth of the follicles. Palpation of the corpus luteum was rectally and in our study the accuracy was only 61.53%. It was reported that rectal palpation usually could be done with relatively good accuracy, for example up to 98% (Llewelyn *et. al.*, 1987) and 97.1% (Perera *et. al.*, 1979). The low accuracy in this study is perhaps due to the lengthy intervals between palpations and also due to relatively small size of the ovaries.

Majority of the animals in the study showed first postpartum oestrus within 60 days postpartum and became pregnant within 90 days. This early return to oestrus and early conception could ensure that the animals calve down once a year. Further many animals became conceived at the first oestrus and others at the second oestrus. These findings are in agreement of the earlier reports where average of 355 days of calving interval was reported for indigenous zebu cattle (Mahadevan, 1952; Wijeratne, 1970) but differ from that of Ozawa *et. al.*, (1978) who reported 445 days calving interval. Although this finding is in agreement of reports on tropical zebu cattle in other countries (Wilson, 1985; Galina *et. al.*, 1989; Voh and Otchere, 1989), it contradicts the general impression of about 50% calving rate for tropical cattle (Galina and Arthur, 1989).

Zebu cattle in general have been considered as relatively low fertile animals with calving intervals ranging from 12 – 24 months in many tropical countries. This wide variation undoubtedly suggests that, the reproductive functions of the tropical zebu cattle is affected to a large extent by the management factors. The influence of calf management and season of calving on postpartum ovarian activity were well demonstrated, (Ozawa and Buvanendran, 1978; Eduvie and Dawuda, 1986; Voh and Otchere, 1989). In Sri Lanka, Perera *et. al.*, (1987) and De Silva *et. al.*, (1982) working with indigenous swamp buffaloes reported a calving interval ranging from 385 to 1140 days in different locations with different management practices. Both of these reports suggested that this variation may be due to variation in the genetic composition, environment, management, particularly suckling and nutrition. In this study, the traditional management practices in the area was limited suckling. The calves were given only once a day suckling up to 2 – 3 months postpartum and only after this period the calves were allowed to suckle the mother ad – libitum. Hence this limited suckling stimulus would have facilitated the early return to oestrus. The results of this study suggest that indigenous zebu cattle, managed under traditional rural dry zone system with minimum inputs in terms of feed and labour and health care are able to reproduce with high degree of efficiency. Variations in the index may exist in different regions if variations exist in the management systems, particularly nutrition and suckling management.

REFERENCES

Abeygunawardena, H., Jayatilaka, M.W.A.P., Ratnayake, D. and Abayawansa, W.D. (1990). Opportunities and limitations of cattle farming in the dry zone of Sri Lanka: Evidence from a village case study. In proceedings of Annual Scientific Sessions of Sri Lanka Veterinary Association, 17 – 18, August, 1990, Kandy, Sri Lanka.

Buvanendran, V. (1975). Breeding for milk production in the dry zone of Sri Lanka. Anim. Prod. Hlth. Bull. 9: 20 – 22.

Buvanendran, V. and Agalawatta, M. (1973). The importance of the dry period in dairy cattle. Anim. Prod. Hlth. Bull. 7: 66 – 71.

Danell, B. (1987). Oestrous behaviour, ovarian morphology and cyclical variations in follicular system and Endocrine pattern in water buffalo heifers. Thesis, Swedish University of Agricultural Sciences, Uppsala.

Department of Metereology, (1991 – 1992). Sri Lanka.

De Silva, L.N.A., Perera, B.M.A.O., Tilakeratne, V. and Ariyakumar, V. (1982). Management patterns and reproductive performance of Lanka buffaloes in different regions of Sri Lanka. 36th Annual Session, Sri Lanka Vet. Assoc., December, 1982.

Economics and Social Statistics of Sri Lanka. Statistics Department. November, 1991.

Eduvie, L.O. and Dawuda, P.M. (1986). Effect of suckling on reproductive activities of Bunaji cows during the postpartum period. Cambridge J. Agric. Sci. 107: 235 – 238.

El – Fouly, M.A., Kotby, E.A. and El – Sobhy, A.E. (1976b). Effect of suckling on uterine and cervical involution in postpartum Egyptian buffaloes. Indian J. Anim. Sci. 46: 221 – 227.

Galina, C.S., Orihuela, A. and Duchateau, A. (1987). Reproductive physiology of zebu cattle. Food Animal Practice. 3: 619 – 632.

IAEA Manual (1984). Laboratory Training on Radioimmunoassay in Animal reproduction. Vienna, Austria.

IAEA Manual (1991). For the determination of progesterone in skim milk and plasma of farm livestock. IAEA, Vienna, Austria.

Jainudeen, M.R., Bongso, T.A. and Tan, H.S. (1982). Postpartum ovarian activity and uterine involution in the suckled swamp buffalo (*Bubalus bubalis*). Anim. Reprod. Sci. 5: 181 – 190.

Llewelyn, C.A., Munro, C.D., Luckins, A.G., Jordt, T., Murray, M. and Lovenzini, E. (1987). Behavioural and ovarian changes during the oestrous cycle in the Boran (Bos Indicus). Br. Vet. J. 143: 75 – 82.

Mahadevan, P. (1952). The performance of the Sinhala cattle. Tropical Agriculturist. CVIII, 253 – 237.

Mahadevan, P. (1953). Cross breeding experiments with Sinhala cattle at Karagoda – Uyangoda. Tropical Agriculturist. 109: 123 – 127.

Morrow, D.A., Roberts, S.J. and McEntee, K. (1966). Postpartum ovarian activity and uterine involution in dairy cattle. J. Am. Vet. Med. Assoc. 149: 1596 – 1690.

Ozawa, S., Buvenendran, V. and Gurusinghe, R. (1978). Survey of production characteristics, feeding and management practices of cattle in some regions of the dry zone of Sri Lanka. Ceylon Vet. J. 26: 10 – 13.

Peiris, G.S., Abeywardena, S.A. and Mohomed, A.R. (1982). Studies on postpartum involution of the bovine uterus and its association with the bacterial flora of the cervico – vaginal mucus and fertility. Sri Lanka Vet. J. 30: 1 – 4.

Perera, B.M.A.O. (1979). Studies on reproductive problems of buffaloes in Sri Lanka using radioimmunoassay techniques. Joint FAO/IAEA division of Atomic Energy in Food and Agriculture. Research coordination meeting on the use of nuclear technique to improve domestic buffalo production in Asia.

Perera, B.M.A.O., De Silva, L.N.A., Kuruwita, Y. and Karunaratne, A.M. (1987). Postpartum ovarian activity, uterine involution and fertility in indigenous buffaloes at a selected village location in Sri Lanka. Anim. Reprod. Sci. 14: 115 – 127.

Rajaguru, A.S.B. (1986). Livestock Development Policy Plan for Sri Lanka. Report of the Society for Researchers on Native Livestock. 11: 37 – 64.

Settergren, I. (1964). The ovarian morphology in clinical bovine gonadal hypoplasia with some aspects of its endocrine relations. Acata Veterinaria Scandinavica. 5: Suppl. 1. Thesis.

Soni, B.K., Abeygunawardena, H., Jayatilaka, M.W.A.P. and Kendaragama, T. (1991). Review of the animal health and extension services of Sri Lanka. Consultary Report, Ministry of Agricultural Development and Research, Sri Lanka.

Sri Lanka Livestock Statistics (1986/87). Ministry of Rural Industrial Development, Sri Lanka.

Voh, A.A. and Otchere, E.O. (1989). Reproductive performance of zebu cattle under traditional agro – pastoral management in Northern Nigeria. Anim. Reprod. Sci. 19: 191 – 293.

Wagner, W.C. and Hansel, W. (1969). Reproductive physiology of the postpartum cow. I. Clinical and histological findings. J. Reprod. Fertil. 18: 493.

Wijeratne, W.V.S. (1970). Cross Breeding Sinhala cattle with Jersey and Friesian in Ceylon. Anim. Prod. 12: 473 – 483.

Wilson, R.T. (1985). Livestock production in central Mali: Reproductive aspects of Sedentary cows. Anim. Reprod. Sci. 9: 1 – 9.