Animal Reproduction Science 171 (2016) 72–80

Contents lists available at ScienceDirect

Animal Reproduction Science

journal homepage: www.elsevier.com/locate/anireprosci

Evaluation of fertility in relation to milk production and productivity of Murrah buffaloes

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ARTICLE INFO

Article history:
Received 23 February 2016
Received in revised form 29 May 2016
Accepted 7 June 2016
Available online 15 June 2016

Keywords:
Life time
Pregnancy rate
Production
Productivity
Standardization

ABSTRACT

Intense selection of buffaloes for milk production at organized herds of the country without giving due attention to fertility traits has lead to deterioration in their performances. The study was initiated to assess the relationship between milk production and productivity with fertility in Murrah buffaloes. In the present study, fertility was defined in terms of pregnancy rate of Murrah buffaloes. Pregnancy rate measures the percentage of non-pregnant animals that become pregnant during each oestrous cycle. Data pertaining to 1224 lactation records of Murrah buffaloes spread over a period 22 years from 1993 to 2014 were analyzed in the study. It was observed that pregnancy rate is negatively associated with 305 days or less milk yield (-0.08 ± 0.04) and wet average (-0.12 ± 0.02) and positively associated with life time (0.15 ± 0.03) in Murrah buffaloes. Wet average is defined as average daily milk yield per lactation of Murrah buffaloes. To achieve around 2000 kg 305 days or less milk yield and 7.5 kg wet average, the level of pregnancy rate in Murrah buffaloes should vary between 30 and 50%. The per unit change in pregnancy rate with respect to milk yield in Murrah buffaloes, were studied using regression analysis. The results suggest that increasing hundred kilogram in 305 days or one kilogram milk yield per day in 305 days, pregnancy rate reduced by 0.9% in overall lactations of Murrah buffaloes. By increasing hundred kilogram life time 305 days or less milk yield and one kilogram life time wet average, pregnancy rate of Murrah buffaloes reduced by about 0.2% and 0.34%, respectively. The study quantifies the decline of pregnancy rate with increase of lactation milk yield and wet average in Murrah buffaloes and emphasis the importance of fertility i.e. pregnancy rate in the evaluation and breeding programmes of Murrah buffaloes.

1. Introduction

India is one of the few countries in world which has contributed richly to the international livestock gene pool. India holds the primary global status in having largest buffalo population and maximum number of buffalo breeds. About 63% of world buffalo milk production and 95% of buffalo milk production in Asia is contributed by Indian buffaloes (Anonymous, 2015). India possesses largest buffalo population of the world, which is 108.70 million (Anonymous, 2012) and their number shows positive growth trends. Among thirteen buffalo breeds present in India, Murrah is the world's best dairy type buffalo with superior genetic potential for milk production. They constitute around 19.5% of total buffalo population of India (Anonymous, 2012). Moreover, Wu et al. (2013) reports that Murrah buffalo share a high level of homology with cattle and other breeds of

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http://dx.doi.org/10.1016/j.anireprosci.2016.06.001
0378-4320/

buffalo. Though, Indian buffalo produces good quality and quantity of milk (about 53% of total milk produced in the country), long service period results in reduced pregnancy rate leading to decrease in calf crop and milk yield on lifetime basis.

Multitude of studies in dairy animals have shown that selection for higher milk yield alone is associated with reduced health and fertility (Lucy 2001; Van Raden, 2004; Cole et al., 2010; De Vries, 2010). Fertility is economically important as it brings buffalo into lactation, reduces reproductive disorders and maximizes the profitability by in time calf production. Most of the developed nations have already formulated national genetic evaluation for female fertility along with the production traits. They have used fertility trait viz. Pregnancy Rate (PR) for genetic evaluation of dairy cattle (Van Raden, 2004; De Vries, 2010; Cabrera, 2011). Pregnancy rate (PR) measures the percentage of non-pregnant animals which become pregnant during each oestrous cycle, as each oestrous cycle represents only one chance for an animal to become pregnant. A comparison of pregnancy rate with other fertility traits from 14 countries has been conducted by Interbull (2006) and the results indicated that pregnancy rate is highly correlated with other fertility traits viz. service period, number of services per conception, non- return rate etc. These correlations underscore the fact that pregnancy rate improves overall fertility of animals (Jorjani, 2007).

In 2003, United States Department of Agriculture began estimating the genetic merit of animals for fertility based on Pregnancy Rate (PR) for cows and Daughter's Pregnancy Rate (DPR) evaluation for bulls. DPR measures the genetic ability of bull's daughters to become pregnant in each oestrous cycle. It is expressed as predicted transmitting ability (PTA) for pregnancy rate (Van Raden et al., 2004). About 18 countries have already evaluated cow fertility based on pregnancy rate, interval from calving to first service and days open (Interbull, 2012). Many countries use a relative weight for fertility traits ranging from 30 to 50% in the selection index of dairy animals (Miglior et al., 2005). This confirms the importance of fertility traits in the selection criteria. The relative emphasis on pregnancy rate in lifetime merit index of Holstein Friesian cattle of USA reported to vary from 7% to 11% for selection of cattle (Van Raden and Cloe, 2014).

Although, conventional selection for milk yield has made buffaloes more profitable producers in the country, continuous selection for increased milk yield alone results in reduced fertility and other performances. Hence it is argued that enhancing both productive and reproductive potential of dairy animals should be the primary objective of an animal breeder. Bull fertility also plays a significant role in improving performance of cows. With the help of improved technologies viz. Artificial Insemination and sexed semen technologies, improved genes are transmitted to a large number of offspring, and the interval between generations can be reduced in buffaloes. Therefore, multi trait selection approach should be carried out in sire and dam selection for improving overall performances of buffaloes.

In India, selection of Murrah buffaloes under Network Project on Buffalo Improvement at present is based on inherent milk producing ability of buffaloes and no efforts have been made in using both milk yield and fertility to improve their performances. Also, no efforts have been made to assess the relationship of milk yield with fertility in Murrah buffaloes. Association between milk yield and fertility in dairy cattle was reported by many workers. Van Raden et al. (2007) observed the genetic and phenotypic association of pregnancy rate with milk yield as −0.20 and −0.32 respectively in Holstein Friesian cattle. Lawlor et al. (2009) reported genetic correlation of −0.11, while De Vries (2010) noted genetic correlation of −0.10 between pregnancy rate and 305 days or less milk yield in Holstein cows. Van Raden et al. (2007) reported that PTA DPR was correlated by 0.46 with PTA productive life (PTA PL) for progeny-tested Holstein bulls, in comparison to the correlation which was lower (.23) for recent for Jersey bulls, while Chad Dechow (2008) reported that PTA DPR had 0.51 correlation with PTA PL. Bifulco et al. (2015) reported the association of fertility with overall performances in Italian buffaloes. The correlation of pregnancy rate with production and life time production traits have not been explored in Murrah buffaloes. The apparent decline in fertility caused by increase in milk in each lactation, overall and life time production has also not been explored in Murrah buffaloes. Therefore, the present study is focused primarily on the evaluation of the relationship of fertility with production and productivity, also to standardize the level of fertility with respect to milk yield and to quantify the decline of fertility with the increase of milk yield in Murrah buffaloes.

2. Materials and methods

2.1. Data

The information of 1224 lactation records along with reproduction performances of 522 Murrah buffaloes spread over a period of 22 years from January 1993 to October 2014, maintained at Dairy Cattle Breeding Division and Livestock Research Station, National Dairy Research Institute, Karnal was collected. The reproduction traits included service period (SP), pregnancy rate (PR) and life time pregnancy rate (LTPR). The production traits included 305 days or less milk yield (MY), wet average (WA), life time 305 days or less milk yield (LTMY) and life time wet average (LTWA).

In the present study, the normal lactation was considered as the period of milk production, by a buffalo, for at least 100 days or a minimum of 500 kg milk produced and the animal calved, dried under normal physiological conditions. For reproduction traits, buffaloes with service period minimum of 62 days and maximum of 300 days were considered. Consequent to the records being normalized, 853 lactation records (distributed as 404, 230, 138 and 81 completed first, second, third and fourth lactations) were obtained. For reproduction traits, 629 records (distributed as 266, 191, 108, 64 completed first, second, third and fourth parity) were obtained after normalization. Service period (SP) and Voluntary Waiting Period (VWP) were considered for estimating pregnancy rate of Murrah buffaloes. Voluntary Waiting Period (VWP) is the period after