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Evaluation of Buffalo Milk Production Performance in Elabered Estate Farm

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ABSTRACT

Eritrea is a country in which more than 80% of its population is engaged in subsistence agriculture. Due to shortage of availability of feed the milk and milk products are very low. To alleviate the above mentioned problem, the Eritrean government has introduced about 65 buffaloes from Italy in 2009, to improve the living standards of the people. The aim of this study was to evaluate the performance of buffalo milk quality and quantities in comparison to the Holstein Friesian under husbandry practices available in Eritrea. The research was conducted in Elabered Estate Farm under the same environment and the same management system. Data for milk yield per lactation, milk composition, Days open and Management practices was collected based on primary and secondary data collection method. The study showed significant difference in the fat, protein and minerals content of buffalo milk when compared with that of Holstein Friesian. However, Solids -not -fat (SNF) and lactose were found to be non significant. The average number of open days recorded for buffalo and Holstein were 140±15.81 and 117.5±10.41days, respectively with no significant difference. Differences in animal type resulted in significant differences in milk yield performance in July ($p< 0.05$). However, there was no significant difference in August and September ($p> 0.05$). The research has realized that buffalo's milk was highly valuable for human consumption and for making milk products. Based on the results it was concluded that buffaloes are the best to alleviate the scarcity of milk and milk products under the existing Eritrean condition.

INTRODUCTION

Livestock production system in Eritrea can be categorized into two as traditional and commercial production system. Rangeland provides most of the feed for livestock, with the remainder coming from crop residues. The annual yield of feed is directly

related to rainfall and other factors. Small-scale commercial livestock farming was introduced during the Italian colonization early in the last century. Now small scale dairy production is carried out in and around the main cities such as Asmara, Dekemhare, Keren, Adi- keih, and Agordet. Elabered Agro- industrial Estate was established in 1958 by an Italian investor called Denadai. It had a total area of 1200 hectares. However, now it has only 300 hectares. The estate comprises two main divisions: Horticulture and Animal production. Buffalo have historically been divided into swamp and river buffalo based on morphological, behavioural and geographical criteria (Groeneveld *et al.*, 2010).

They are sometimes referred to as different subspecies; river buffalo as *Bubalus bubalis bubalis* and swamp buffalo as *Bubalus bubalis carabenesis*. The world population of buffalo (*Bubalus bubalis)* has been estimated at over 140 million head and Buffaloes are the second largest source of milk supply (FAO, 1991). River buffalo are used mainly for milk production (Han *et al*., 2007). Buffalo milk constitutes over 12% of the global milk production and it provides more energy per unit volume than provided by cow's milk due to its higher fat and protein content (FAO, 2013). In most of the buffalo milk producing countries of Asia it is observed that there are large seasonal variations in breeding and calving in buffaloes. In India and Pakistan 80% of the buffaloes calve during June and December causing a decline in milk production in the summer months (Ganguli, 1981). When exposed to extreme hot or cold conditions, the buffaloes' milk production and reproductive efficiency are strongly affected (Sastry, 1983).

Dairy buffalo production has been traditional in many parts of the world where fresh buffalo milk and cheese are popular products. In Eritrea most of the farmers rear local and exotic cattle breeds but these breeds are not efficient converters of poor quality forages compared with buffalo. Buffaloes are efficient converters of poor quality fodder to milk, which is rich in nutrition and quality (Razdan, 1980). Buffalo milk is used primarily to produce cheeses, especially mozzarella (Aspilcueta-Borquis *et al.*, 2012). Due to this reason the Eritrean government has imported buffalos from Italy in 2009, as a national project for milk security and to increase mozzarella cheese production (MOA, 2009). The introduction of Italian and US riverine buffalo (dairy breeds of buffalo) genetics into Australia in the mid nineties has proven to be of great productive advantage to add to the swamp base of the original introductions nearly 190 years ago. Whilst still a very small industry in terms of numbers in the Australian meat industry context, buffalo have spread only in the last 20 years to all Australian states. These new introductions have the potential to allow for a larger future expansion of the meat industry and a greater penetration of the cheese and yoghurt markets (Singh and Barwal, 2010).Therefore, this has arose the need to study buffalo as an important animal under Eritrean environment and husbandry system for its adaptation and milk production efficiency compared to cattle. The aim of this study was to evaluate the performance of buffalo milk quality, quantities and reproductive performance in comparison to the Holstein Friesian under husbandry practices available in Eritrea.

MATERIALS AND METHODS

Description of study area: The study was conducted in Elabered estate farm, located in Anseba region of Eritrea, about 68 km North West of Asmara, at an elevation between 1400-1500m above sea level. It has a moderate climate, with annual temperature ranging between 6 and 31^0C with an average annual rainfall of 500 mm and relative humidity of 64 %.

Methodology: The study was conducted on eight cows (four Holstein milking cows and four buffaloes selected based on their parity number ranging from 1st calving to 3rd calving under the same feeding and health care management.

Data for milk yield per lactation, milk composition, days open and management practices was collected based on primary and secondary data collection methods; by disseminating questionnaires and through direct interviews.

Milk was collected from both buffaloes and Holstein Friesian, which were divided into various groups according to their parity (1, 2, and 3), and season of parturition (July, August and September).

Milk samples were analyzed for milk composition according to A.O.A.C. (2009) using milk analyzer lacto scan (Lactostar (c), 2004 Funk Gerber Firmware Rev: 3.03e, #3510-053106, Germany) in Animal and Plant Health Laboratory, Asmara.

Data analysis: Data were analyzed using T-test with significance level at 5%. Data was analyzed using statistical software of 'GENSTAT' (3.2).

RESULTS AND DISCUSSION

***Milk composition*:** Mean of Solids-not-fat (SNF), protein, fat, lactose and minerals percentage are presented in Table 1. The difference in type of animal showed a substantial influence on milk quality in both cattle and buffaloes. Differences in animal type resulted significant differences in fat, protein and minerals ($p< 0.05$). However, there was no significant difference in lactose and SNF ($p> 0.05$). This could be due to feed conversion efficiency, in which buffalos are efficient converters of low quality forage. As reported by Razdan (1980), buffalo digest feed more efficiently than cattle particularly when feeds are poor quality high in cellulose. Though the result was non-significant, mean value of lactose and SNF of buffalo was numerically greater than Holstein Friesian. Research that was conducted in other places showed that buffalo milk was considerably higher in fat (7.45 %) and protein (4.36 %) than milk from improved or native cows (Ranjhan, 1988). In this research the average fat and protein percentage of buffalo was about 8.28% and 4.97%, respectively. The milk of buffaloes has almost twice the quality of cattle milk (FAO, 1991). Therefore, buffaloes met higher percentage of fat and protein under Eritrean husbandry practices.

Table 1: Average milk compositions of buffalo and Holstein cattle

Animal type	Fat%	Protein %	Lactose %	SNF %	Mineral %
Buffalo	8.28 ±1.3	4.97 ± 1.0	6.36 ±0.50	10.71± 2.52	1.61 ± 2.79
Holstein	3.42 ± 0.84	3.92 ± 0.19	5.35 ± 0.44	9.95± 0.82	0.59± 0.04
P – value	0.03	0.01	0.81	0.05	0.001

The following figure shows the average fat % of buffalo and Holstein in July (date 1 and date 2), August (date 3 and 4), and September (date 5). Highest and lowest fat percentage of buffaloes was recorded in July (date 2) and August (date 3), respectively. The fat percentage started to be high in July

and decreased in August (date 3) as the milk production has increased. Later in September the fat percentage started to increase at an increasing rate. This fluctuation indicates that there was a difference in feed management. It has been reported that local buffaloes and cows digest concentrates and good quality roughages equally well. With poor quality roughages like rice straw however, the buffalo excelled the cow in digesting dry matter and crude fiber (El – Ashry, 1988). Especially in grazing system buffaloes are excellent and this is due to their animal type and feed conversion efficiency (Razdan 1980). The animals were confined in the first month (July) being fed alfalfa and elephant grass as fresh. However, in August and September animals were under open grazing system. Therefore, the fat percentage decreased in July and then it started to increase starting from August until September. The reason for this increment could be due to high fibrous feed from grazing. In addition to grazing, about 30 kg per day per cow alfalfa, corn fodder and elephant grass were being fed in August and September. Under any management practices (confined or loose grazing system) fat percentage of buffalo's milk was superior over that of Holstein (Figure 1).

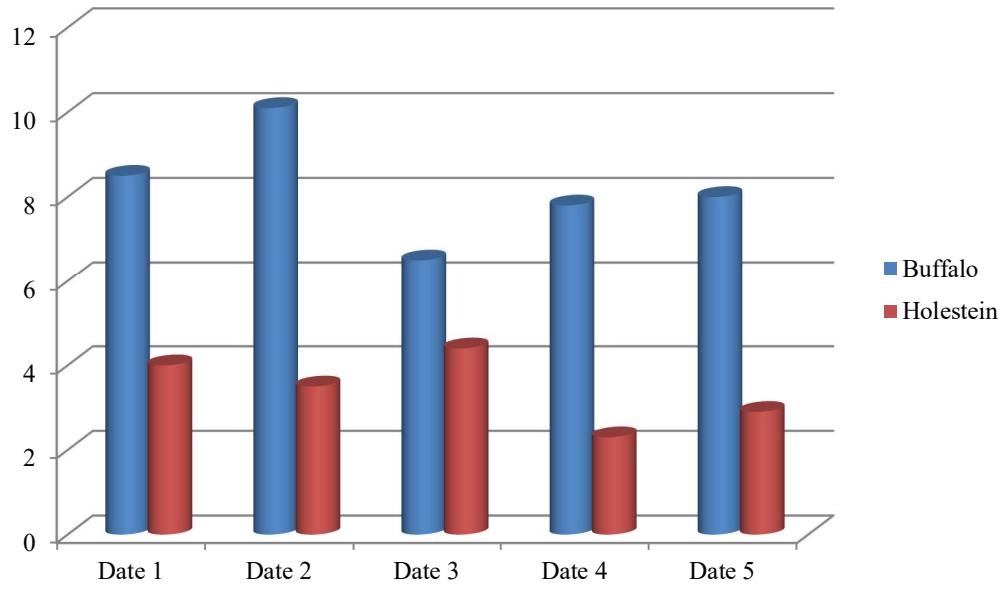

Figure 1: Fat % of Buffalo's and Holstein milk in different months

The average milk protein % of buffalo and Holstein in July (date 1 and date 2), August (date 3 and date 4), and September (date 5) is indicated in Figure (2). Highest and lowest protein percentage of buffaloes was recorded in August (date 3) and September (date 5) respectively. The protein percentage started to increase in July and decreased in August (date 4) at a decreasing rate in September. This fluctuation revealed that there was a difference in feed management.

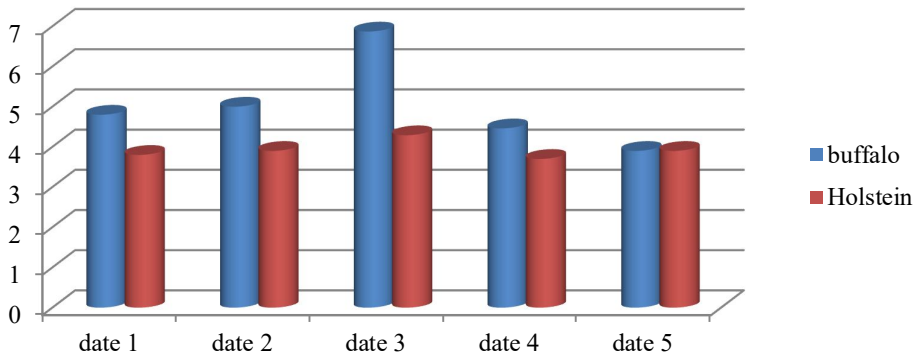

Figure 2: Protein % of buffalo's and Holstein milk

Buffalo milk is one of the highest mammalian milk in the level of constituents. Mainly, fat content is the main fraction of buffalo milk and it is responsible for high nutritive value (Ménard *et al.,* 2010). Research on the use of cheaper sources of nitrogen indicated that the urea can replace up to 50% of total nitrogen of rations for lactating buffaloes with no adverse effect on milk or fat yield (Khattab *et al.,* 1981).

Milk yield performances: The average milk yield showed fluctuations for both buffalo and Holstein as there was inconsistency in feed supply and quality. Differences in animal type resulted significant differences in milk yield performance in July ($p < 0.05$). However, there was no significant difference in August and September ($p > 0.05$) though the milk production of Holstein was greater than buffalo numerically. High milk yield was recorded in August; the main reason for this record was due to availability of enough green feed. However high milk yield is associated with high quality feed (concentrate) intake. The animals were supplied most of the time with poor quality of feed and low husbandry practice and this resulted in low milk production of the animals. However, under improved feeding management Holstein cows produce higher milk production (have good genetic potential for dairy) as compared to buffaloes. Therefore, this low milk yield of Holstein could be due to low quality forages and feeding management in the farm. The types of forages available in Elabered Estate farm were Alfalfa, Elephant grass, corn fodder and dry grass. These forages were used as hay and silage.

Table 2: Average milk yields per day in liters for three months

Animal type	July	August	September
Buffalo	4.1±0.80	6.0±0.88	5.5±0.53
Holstein	6.5 0±0.90	7.0±0.40	6.5±0.93
P – value	0.007	0.08	0.13

Buffaloes can graze on low productive pastures on which the production of milk is possible and economically profitable. The dairy cattle can obtain large amount of energy, protein, vitamin, mineral, lipid and water from the forage. As reported by Razdan (1980), buffalo digest feed more efficiently than cattle particularly when feeds are poor quality high in cellulose. About 80% of the dairy farm cost is spend on animal feed so careful

attention should be given for feeding dairy cattle. Therefore, understanding to the type of feeds and their proportion used and other management practices in the farm is essential. Forages are classified as legume and grass, which can be fed to animals as a green feed or hay and silage. Continuous availability of forages is essential because it is a primary constituent of dairy ration. The Riverine buffaloes almost adapted Elabered Estate farm within a short period of time. This was due to their ability of resistance to extreme hot and cold environmental conditions with adequate provision of water for wallowing in hot climate. In addition to this they had remarkable endurance in slow but heavy drought. They wallowed once in a week in hot summer in the dam and mud of the farm. This helped to keep cool, served to cake the animal with mud, thereby protecting it from biting insects. As reported by Sastry and Tripathi, (1988) simple body wetting two to three times during the hottest part of the day was found to keep buffalo in a reasonably comfortable condition as judged by their physiological reactions. Loose housing was practiced for buffalo and the wallowing frequency was once in a week in hot summer. Management practices of buffalo's is advantageous to the small – scale farmers especially in housing as compared to Holstein Friesian, they can be reared in simple constructed houses. Housing needs to be very simple, because the winter is mild and the rainfall is medium, with severe heat in the summer. Such a climate calls for open structures allowing plenty of air movement to keep heat stress to a minimum (Sundaresan, 1973). Production performances of Murrah buffalo in tied up housing and in loose housing were studied, and the result proved beyond doubt that loose housing was more profitable, with increased yields (Jagatjit Singh *et al.,* 1993).

Reproductive performances: The average number of open days recorded for buffalo and Holstein were 140±15.81 and 117.5±10.41 days respectively with no significant difference. Although no statistical difference was observed, mean value of days open of buffalo was numerically greater than Holstein Friesian. Female buffaloes never show sign of heat (silent heat) and the bull was always being kept with the females. Many mating took place at night and were therefore unobservable. The estrus cycle stayed for 24 hours. The difference in the sign of heat could be the most probable reason for the variation in the days open. The results obtained on open days are presented in Table 3.

Table 3: Reproductive performance of Buffalo and Holstein cows

Reproductive parameter	Cattle type		P value
	Holstein	Buffalo	
Days open (days)	117.5±10.41	140±15.81	0.063

CONCLUSION:

Buffalo's milk contains higher amount of fat and protein percentage. Therefore, it is highly valuable and it is good for making cheese. Though the milk composition of buffalo was higher than Holstein, buffaloes had lower milk yield performance than Holstein.

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