Feeding evaluation on the production and quality of dairy buffalo milk (Murrah) at the traditional farms in Asam Kumbang

U Hasanah*, K N Sinamo, Hasnudi, P Patriani and E Mirwandhono

1Department of Animal Husbandry, Faculty of Agriculture, Universitas Sumatera Utara, Medan, Sumatera Utara, Indonesia.
2Department of Food Science and Technology, Faculty of Agriculture, Universitas Sumatera Utara, Medan, Sumatera Utara, Indonesia.

E-mail: *u.hasanah@usu.ac.id

Abstract. The production and quality of milk of Murrah Buffalo can be affected by many factors. One of them is feed. The feed with high quality can increase the productivity of an animal. The aim of this study is to evaluate the quality of feed on the production and quality of Murrah buffalo milk at the traditional farms in Asam Kumbang. This research is using four buffalo from Murrah species. The variables observed in this research were milk production, milk quality (carbohydrate, protein, contamination of Staphylococcus aureus, total plate count bacteria), nutrient contents of feed (dry matter contents, crude protein, crude fat, crude fibre, and total digestibility nutrient), temperature and relative humidity. The result shows that the feed quality is good. The high ratio of concentrate in the ration is for fulfilled the requirement of buffalo. The values of milk production are 7.16±0.38 L head⁻¹ day⁻¹; the percentage of protein in buffalo milk is 2.93±0.13%. The high milk production caused by the quality of feed, the ratio of forage and concentrate, and month lactation. Staphylococcus aureus bacterial contamination of milk is positive. It is caused by hygiene during milking is very low.

1. Introduction
Consumption of milk is still low, especially for buffalo milk, whereas buffalo milk has good quality than dairy cows, especially in protein and fat content of milk [1]. The low consumption of buffalo milk is caused by low knowledge of the people that buffalo milk has many benefits and high quality. In Indonesia, buffalo milk is still considered foreign by the people, so buffalo milk is only used for traditional needs, especially, buffalo milk is used as the basic ingredient for making traditional food in North Sumatera (Dali Ni Horbo) and Dangke from West Sumatera.

The feed is one factor that is very influential on a farm. The higher quality of feed can increase the productivity of an animal, especially on milk production, milk quality, feed intake, and digestibility [2]. The ration with 40% corn silage in dairy cow ration can increase milk production until 1.91 L day⁻¹, and ration without 40% corn silage in dairy cow ration is only increase milk production until 0.18 L day⁻¹. The low quality of feed can decrease milk production. Nutrient content of milk (protein, carbohydrate, fat, lactose) can be affected by the feed, especially for feed intake of feed. The higher intake of forage can increase the amounts of milk fat on dairy cows [3].
The problem that occurs in buffalo farms is production of milk is still lower than milk production of dairy cow, but maintenance with a dry lot management system on Mediterranean, Murrah buffalo can produce milk production up to 13.87 kg day$^{-1}$ [4], so that, milk production in North Sumatra could be increased by providing good quality of feed and in sufficient quantities [5].

The real problem that often occurs in the traditional farms of Murrah buffalo is the low information about the quality of feed, so the feed that given to an animal is not in accordance with the needs of the animal. Giving the feed that is not in accordance with the needs of animals can reduce the productivity of animals [3]. The aim of this research is to evaluate feed quality on the production and quality of Murrah buffalo milk at the traditional farms in Asam Kumbang.

2. Material and methods

The location of this research is at the traditional farms in Asam Kumbang, North Sumatera Province of Indonesia in Juli 2019. The site is characterized by a warm-humid tropical climate with an average 28.3°C annual air temperature and 45% of relative humidity. Laboratory work was conducted at Universitas Sumatera Utara, Medan for analysis quality of feed and Laboratory of Industry Research and Standardization Centre, Medan for analysis quality of milk.

Four buffalo were lactating with initial conditions of 489.1 ± 42.77 kg body weight and 3.75 ± 0.81 months lactation. The procedure of this research are sampling of the feed, measurement of milk production for three days, and taking four samples from four buffaloes.

The variables observed in this research were nutrient contents of feed (crude protein, crude fibre, crude fat, total digestibility nutrient (TDN), dry matter), milk production, milk quality (pH value, water percentage, carbohydrate, protein, TPC (total plate count) of bacteria and contamination of Staphylococcus aureus), buffalo bodyweight, temperature and relative humidity.

Buffalo milk production was collected every day at 4 pm and 2 pm for three days in a row. Sample of milk, body weight of six buffalo was collected on the 3rd day.

2.1. Ration composition

Table 1. Nutrient contents of concentrates, tofu waste, cassava waste, and sludge palm oil

| Parameters          | Concentrates | Tofu waste | Cassava waste | The sludge of palm oil |
|---------------------|--------------|------------|---------------|------------------------|
| Dry matter (%)*     | 94.06        | 14.96      | 19.45         | 21.59                  |
| Crude protein (% DM)*| 13.58       | 19.07      | 7.64          | 10.38                  |
| Crude fibre (% DM)* | 16.21        | 22.18      | 21.91         | 19.73                  |
| Crude fat (% DM)*  | 5.42         | 7.03       | 1.54          | 8.94                   |
| TDN (%DM)           | 64.76        | 70.48      | 63.42         | 71.78                  |

*Analysis result of Biochemical Laboratory in Universitas Sumatera Utara

Table 2. Nutrient contents of corn leaf and natural grass

| Parameters          | Corn leaf | Natural grass |
|---------------------|-----------|---------------|
| Dry matter (%)*     | 19.06     | 18.92         |
| Crude protein (% DM)*| 7.57      | 5.21          |
| Crude fibre (% DM)* | 28.72     | 30.17         |
| Crude fat (% DM)*  | 2.59      | 1.65          |
| TDN (%DM)           | 56.78     | 54.81         |

*Analysis result of Biochemical Laboratory in Universitas Sumatera Utara
The feed used in this research consists of concentrates, tofu waste, cassava waste, sludge of palm oil, corn leaf, and natural grass. Nutrient contents of concentrate, tofu waste, cassava waste, sludge of palm oil can be seen in Table 1 and corn leaf, natural grass can be seen in Table 2.

3. Result and discussion

3.1. Feed intake
Buffalo productivity can be affected by many factors, one of them is feed consumption. Feed consumption data in this research were calculated based on dry matter (Table 3). The average dry matter intake (DMI) is 16.13 kg head\(^{-1}\)day\(^{-1}\), with the ratio of forage and concentrate is 30:70. This has been classified as a normal ratio because the maximum concentration of concentrate in the ratio is 70%. Using concentrate more than 70% in the ration will have an impact on animal health, especially the health of metabolism of buffalo and milk production. The high ratio of concentrate until 70% can increase the milk production of dairy cows [3].

| Parameters                                      | Values         |
|------------------------------------------------|----------------|
| DMI of ration (kg head\(^{-1}\) day\(^{-1}\)) | 16.13 ± 0.72   |
| DMI of concentrate (kg head\(^{-1}\) day\(^{-1}\)) | 11.40 ± 0.88   |
| DMI of forages (kg head\(^{-1}\) day\(^{-1}\))  | 5.14 ± 0.82    |
| DMI of forages : concentrate ratio              | 30:70          |

3.2. Milk production and quality of buffalo

| Parameters                                      | Values         |
|------------------------------------------------|----------------|
| Milk production (L head\(^{-1}\) day\(^{-1}\)) | 7.16 ± 0.38    |
| Milk quality                                   |                |
| pH                                             | 6.65 ± 0.06*   |
| Water (%)                                      | 79.87 ± 0.08   |
| Protein (%)                                    | 2.93 ± 0.13*   |
| Carbohydrate (%)                               | 2.90 ± 0.18*   |
| TPC of bacteria (CFU/ml) \(x 10^6\)             | 87 ± 6.39**    |
| \textit{Staphylococcus aureus}**               | +              |

* Analysis result of Biochemical Laboratory in Universitas Sumatera Utara.
** Analysis result of Microbiology Laboratory in Universitas Sumatera Utara

The data of milk production in this research is 7.16 L head\(^{-1}\) day\(^{-1}\). This result is almost the same from the research before, at the 5\(^{th}\) months lactation (mid-lactation), buffalo can produce the milk until 7-9 kg day\(^{-1}\)[6]. The higher milk production in this research can be affected by feed, especially feed intake of concentrate and month of lactation. The animal that used in this research is the 3\(^{rd}\) month of lactation (high production). High production of milk in the dairy animal occurs in the 3\(^{rd}\) until 6\(^{th}\) month lactation [11]. The longest of the month of lactation is the start of the dry period and it can decrease the production of milk [3].

The chemical content of the quality of milk in this research are pH value, water content, protein content, carbohydrate content, and contamination of bacteria, especially total plate count of bacteria and \textit{Staphylococcus aureus} (Table 4). The quality of milk in this research has a pH value of 6.65, the protein content of 2.93%, the carbohydrate content of 2.90%, TPC of bacteria of 87 (CFU/ml) \(x 10^6\) and contamination of \textit{Staphylococcus aureus} is positive. The protein of buffaloes’ milk produced in this research is suitable at the standard values determined by the standard [7], the minimum of protein
is 2.8%. Data contamination of bacteria is out of standard [7], especially the TPC of bacteria because the standard of TPC of bacteria of milk is low than 1x10^6 (CFU/ml) [8], whereas in this research is up to 87 x 10^6 (CFU/ml). The value of bacterial contamination in this research is out of the standard limits. It is caused by low hygiene during milking, and there is no process for cleaning of buffalo first, especially the udder. The good procedure is sanitation of people and buffalo first, and then the udder is cleaned and wiped using warm water (60-70°C) [9].

The real milking procedure in this research is not good because there is not process sanitation. The udder of buffalo is very dirty with mud because the buffaloes that return to the farm after being pastured are the directly milking process. The udder is only wiped using a cloth with plain water, not warm water as good sanitation so that microbial contamination it will be easier. The milk is not immediately closed and stored in a cold temperature after the milking process, it is left open in a bucket or milk container [10].

4. Conclusions
The traditional farms in Asam Kumbang have a balanced ration for buffaloes because they have good quality and high production of milk. But, the process of sanitation and hygiene on the farm is still very low, which is caused by bacterial contamination that exceeds the required standard.

References
[1] Kanakakhewage M, Jasinghe O, Sujani S and Seresinhe T 2016 Effect of supplementation of different concentrate rations on weight gain, milk yield and composition of cross bred buffalo cows Proc.Intsem.LPVT-2016 122-1226
[2] Hasanah U, Hasnudi, Mirwandhono E, Ginting N, Patriani P and Baiaqi M 2019 Carcass composition of fat tailed sheep at different slaughter weight IOP Conf. Series: Earth and Environmental Science 260 2019 012055
[3] Hasanah U, Permana I G and Despal 2017 Introduction of complete ration silage to substitute the conventional ration at traditional dairy farms in Lembang Pakistan Journal of Nutrition 18 8 577-87
[4] Coletta A, Caso C, Castrillo M, Parlato M, Zullo A and Zicarelli L 2007 Fit of the Wood function to milk yield data collected by different recording systems in Mediterranean Italian buffalo Italian Journal of Animal Science 66 2 503-5
[5] Damayanthi E, Yopi, Hasinah H, Setyawardani T, Rizqiati H and Putra S 2014 Characteristics of water and swamp buffalo milk in North Sumatera JIPI 19 2 67-73
[6] Santillo A, Caroprese M, Marino R, Sevi A and Albenzio M 2016 Quality of buffalo milk as affected by dietary protein level and flaxseed supplementation J. Dairy Sci. 99 10 7725-32
[7] Badan Standardisasi Nasional Indonesia [Indonesian National Standardization Agency] 2011 Susu Segar Bagian 1 Standar Nasional Indonesia [Fresh Milk Indonesian National Standard] 3141.1:2011 (Jakarta: BSN)
[8] Miskiyah 2011 Study of Indonesia National Standard for liquid milk in Indonesia J. Standardisasi 13 1 1-7
[9] Usmiati S and Abubakar 2009 Teknologi Pengolahan Susu [Milk Processing Technology] (Bogor: Centre for Postharvest Agriculture Research and Development)
[10] Wulandari Z, Taufik E and Syarif M 2017 Kajian kualitas produk susu pasteurisasi hasil penerapan rantai pendingin [Study of the quality of pasteurized milk products as a result of applying the cooling chain] J. Ilmu Produksi dan Teknologi Hasil Peternakan 5 3 94-100
[11] Despal, Permana I G, Toharmat T and Amiroenmas D E 2017 Pemberian Pakan Sapi Perah [Provision of Dairy Feed] (Bogor: IPB Press)

Acknowledgment
This research was supported by Talenta Program 2019 from Universitas Sumatera Utara with contact number 471/UN5.2.3.1/PPM/KP-TALENTA USU/2019.