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The Impact of Bypass Fat on Milk Contents And Yield in Indigenous Buffalo (B*ubalus Bubalis*) of Sindh, Pakistan

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Abstract: Introduction: Buffalo and cow milk have a great affinity for strong bones, healthy teeth and in various heart diseases. The study was carried out on Kundi buffalo to assess the outcomes of bypass fat on dry matter, milk output, milk contents, body mass gain, nutrient digestibility, and production costs. **Methodology**: 12 buffaloes of early third and fourth lactation were selected, divided into two groups (six each) for ninety days experiment. In the test animals, additional 300 mg bypass fat was given with balance ration containing 16% of crude proteins, while in control group only balance routine ration was provided. The data was statistically evaluated using a one-way analysis of variance in a completely randomized design (CRD), and differences were assessed using a t-test. **Results**: The results indicated that mean values in group-A regarding the dry matter intake (DMI) was significantly elevated ($P<0.05$) (14.29±1.42 kg) as compared to control group (13.65 ± 2.174 kg). At the end of experiment the mean of daily milk production (7.73±1.115 liters/day) was also reported higher ($P<0.05$) in group-A. The milk yield of Group-A was raised up to 15.39% than the control group. Though, the buffaloes under bypass fat treatment were not found significantly higher in weight gain, but the milk contents in context of solids not fat, fat and total solids presented as $P<0.05$ between the treatments. **Conclusion**: Therefore, it is concluded from the conducted study that, bypass fat can be employed to produce milk both quantitatively and qualitatively at a reasonable cost.

Keywords: Interleukin-8, atopic dermatitis, cytokines, T lymphocytes.

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Introduction

Buffalo and cow milk have a great affinity for strong bones, healthy teeth and in various heart diseases. It is one of the good source of minerals i.e. magnesium, potassium, phosphorus and also very rich with calcium and protein etc. The consumption of milk is increasing day by day, which leads to high demand of milk in the world but the milk production of buffaloes in Pakistan is significantly much alarming as compared to animal strength and various disease conditions [1].

The scientists and researchers are endeavoring hard to devise different ways and techniques through which increasing demand of milk and meat can be fulfilled. Therefore, a declining trend was seen in the percentage of milk produced in Pakistan, India, Nepal, and particularly Egypt [2].
Milk production enhancement through modern technologies is thought to be imperative for the developing countries. A calcium salt of long-chain fatty acid energy supplement for dairy cattle used as the bypass fat supplement and in fact, bypass fat technology helps animals meet their energy and critical fatty acid requirements so they can express their maximum potential for milk production while also protecting the nutrient from degradation and bio hydrogenation in the rumen [3,4]. Since the meat and milk from cattle and Kundi buffaloes contain 70% animal protein, they are regarded as an important component of the human diet. With 32.7 million heads, buffaloes play a significant role in Pakistan's cattle industry, producing 29,565 metric tons of milk annually (66% of total milk production) and a big share in meat and hide production and in fact, buffalo milk contains beneficial compounds that provides the antioxidant protection and neuron protection [5,6].
Additional fat provided as bypass fat doesn't affect the rumen's ability to ferment food; instead, it gives the animal more energy to produce more milk after being broken down in the abomasum and small intestine and absorbed from there. This aids in raising the amount of unsaturated fatty acids in milk, production of creamy butter and and healthy milk for ingestion [7,3].
The goal of the experiment was to determine the effects of feeding bypass fat on Kundi buffalo's nutritional intake, feed conversion efficiency, milk composition, and production performance in comparison with normal and routine ration formulation.

Materials And Methods

The experiment was carried out on Kundi buffaloes (n=12) divide into two groups i.e. group-A (test group) and group-B (control group) with the live body weight around 500±50 kg (approximately 6±1 years age) to evaluate the outcomes of bypass fat on feed conversion efficiency, composition of milk and production performance of animal. Average milk yield of buffaloes was 10 liters. The study was conducted for ninety (90) days after the successful completion of acclimatization period of fourteen days.
The buffaloes were kept at commercial dairy farm in Karachi for the experimental study. All the animals of test and control groups were underwent for deworming, followed by vaccination against Hemorrhagic Septicemia (HS) and Foot and Mouth Disease (FMD) according to stipulated schedule. All the buffaloes were kept individually in each shed with free access to drinking water.

Feeding mmanagement and treatments

Green fodder was freely given to the buffaloes while concentrate was provided 1kg for every 3 liters of milk produced. Daily records of the amount of feed consumed and rejected were recorded. Group A was maintained on a balanced diet with 300 mg of bypass fat (Ghazi Brothers-Bypass fat RP10 1Kg) per buffalo per day, whereas group B was maintained as the control group on a balanced diet with 16% crude protein and an energy supplement for dairy animals that contains the calcium salt of long chain fatty acids.

Sample collection and analysis

Strict hygiene procedures were maintained during two times (morning and evening) milking of buffaloes. Milk samples of all experimental buffalo were collected and proceeded for analysis at Department of Animal Nutrition, Baqai College of Veterinary Sciences, Karachi. Milk was examined according to AOAC 2000 guidelines. The Gerber and Kjeldhal procedures were used to measure the fat and protein in milk, respectively [8,9]. Moreover, by using Fleischmann's formula, total solids (TS) and solid not fat (SNF) were calculated.. The experimental animals

were weighed once a week to monitor weight changes. Average milk production was divided by average DMI to determine feed efficiency [10].

Statistical Analysis

One way analysis of variance was used to statistically examine the data under a completely randomized design. The t-test was applied to contrast the treatment means [11].

Results

The current study was designed to determine the effect of bypass fat on production of milk in Kundi buffaloes. The data on dry matter intake on weekly interval, daily milk production, weekly milk composition, weekly weight gain were collected and analyzed from the start to end of the experiment. The results on the above-mentioned parameters are given below.

Dry Matter Intake

DMI was documented on weekly interval in buffaloes placed in each group and kept under control during the experiment. Mean of daily green fodder consumption in group-A was recorded as 11.628 ± 1.461 and, in control it was revealed as 11.356 ± 2.206 kg. Mean daily concentrate intake in Kundi buffaloes was 2.662 ± 0.323 kg and 2.294 ± 0.477 kg on bypass fat and under control groups, respectively (Table 1). Overall the mean of DMI in buffaloes under bypass fat was recorded higher (14.291 ± 1.425 kg) then the group-B (13.651 ± 2.174 kg).

Feed Efficiency

Mean feed efficiency value in Kundi buffaloes on bypass fat was comparatively higher as compared to under control. Mean feed efficiency was 0.618 ± 0.105 and 0.565 ± 0.142 in buffaloes on bypass fat and control, respectively. Statistically non-significant difference was recorded between treatments (table 1).

Table 1: By pass fat outcomes on daily DMI and Feed Efficiency on Kundi Buffaloes

Parameter	**Group-A**	**Group-B**
	Kg	
Green Fodder	11.628 ± 1.461	11.356 ± 2.206
Concentrate	2.662 ± 0.323	2.294 ± 0.477
Total Dry Matter Intake	14.291 ± 1.425	13.651 ± 2.174
Feed Efficiency	0.618 ± 0.105	0.565 ± 0.142

There were no statistically significant differences in green fodder intake, total dry matter intake and feed efficiency between group-A and group-B buffaloes, but concentrate intake showed significantly ($P<0.05$) different between groups of Kundi buffaloes.

Milk Production

The average of daily milk production was recorded 7.739 ± 1.115 and 6.573 ± 1.562 liters in kundi buffaloe in response to bypass fat supplementation and under control respectively. The group-A was produced about 15% higher average milk than group-B, which was recorded significant $P<0.05$ between the two groups as shown in table 2.

Table 2: Outcome of bypass fat on milk contents and yield in Kundi Buffaloes

Parameters	**Group A**	**Group B**
Average Milk Production (Liter/day)	7.739 ± 1.115	6.573 ± 1.562
Average Solids not fats%	10.376 ± 0.391	9.969 ± 0.369
Average Fat%	6.981 ± 0.411	6.715 ± 0.244

Average Total Solids%	17.356 ± 0.701	16.684 ± 0.361
Average Protein%	3.680 ± 0.306	3.784 ± 0.317
Average Weight gain (Kg)	0.251 ± 0.067	0.241 ± 0.067

Milk Composition

Milk composition tests were conducted on weekly basis. The buffaloes on bypass fat treatment showed higher levels of solids not fat, fat and total solids as compared to control group while protein, density and water contents were decreased in group-A compared to group-B (Table-2). The mean average of solid not fat, fat and total solids content of treated group was higher (10.376 ± 0.391), (6.981 ± 0.411) and (17.356 ± 0.701) as compared to control group (9.969 ± 0.369), (6.715 ± 0.244) and (16.684 ± 0.361), respectively. Milk composition of both groups regarding solids not fat, fat, total solids, protein and water content were indicated significant $P<0.05$ as shown in (Table 2).

Weight Gain

Weekly weight gain were taken in Kundi Buffaloes assigned to various treatments. Buffaloes receiving a bypass fat treatment gained an average of 0.321 +/- 0.052 kg per week, compared to 0.241 +/- 0.067 kg per week in the control group. Between the two groups of Kundi buffaloes, there was a weekly weight gain difference that was found significant ($P<0.05$) as mentioned in (Table 2).

Milk Production and economic impact

The total cost per day on feeding of Group A and Group B were Rs. 586 and Rs. 486 and total profit per day was Rs. 574.85 and Rs. 499.95 respectively (Table 3). Whereas, the feeding cost of Group-A was expensive but more profitable than Group-B.

Table 3: By-pass fat outcomes on milk cost

Parameter	**Group A**	**Group B**
	Cost in Pak rupees	
Feed	586	486
Milk value	75	75
Milk yield (liter/day)	8.739 ± 1.115	7.573 ± 1.562
Income from milk	1160.85	985.95
Profit	574.85	499.95

Discussion

The effect of bypass fat treatment in Kundi buffaloes resulted in high consumption of dry matter from green fodder and concentrate as compared to kundi buffaloes under control treatment, the same findings were also reported as described in the citations [12b,13,14] followed by modest increase of concentrate consumed, as well as changed the roughage concentrate ratio slightly, varying from 70.53 : 29.47 in a control group to 65.02 : 34: 98 in treatment group.

In many studies, similar levels of nutrient intake were seen in the experimental animals as compared to the control ones following the addition of bypass fat, which was included at a typical level of @ 5-6% of DMI in the animal ration [13-17]. Due to intake of bypass fat Digestibility of (DM, CP and TDN) and milk production with fat contents also increased in lactating buffaloes as compared to control group [18, 19].

The mean milk composition showed that the buffaloes on bypass fat treatment showed significant difference in levels of solids not fat, fat and total solids as compared to control group, same findings were also reported by [20,13,21]. Moreover, in order to maintain energy intake in high-

yield dairy cows, bypass fat supplementation is still a suitable solution. With no detrimental effects on the health of the animals, bypass fat has been shown to boost milk production, milk quality, body measurements, and reproductive efficiency in dairy cows. However, the economic effectiveness of employing supplementary fat depends on the quantity of fat to be fed and the timing of feeding in addition to the right selection of the fat sources. Despite being a long-standing technique, using bypass fat is continually being investigated and developed to make it more lucrative and available to farmers [22, 20]. In fact, the supplementation of bypass fat for animal has a significant effect on the milk fat content, and also increased the daily average production, quality and quantity of milk [23].

Weekly weight gain indicated a higher weekly gain in buffaloes on bypass fat treatment than control. This shows that the extra energy provided by feeding the animal a bypass fat supplement was not used for body fat synthesis or deposition, but was instead utilized to make more milk [24-26].

Feed efficiency value in Kndhi buffaloes on bypass fat was comparatively higher as compared to under control. Mean feed efficiency was 0.618 ± 0.105 and 0.565 ± 0.142 in buffaloes on bypass fat and control, respectively. Statistically non-significant difference was recorded between treatments. We recommend the use of mentioned bypass fat amount in lactating buffaloes, due to the fact that is not only profitable but also very beneficial for the health of buffaloes. Further studies should be carried out about the effects of feed nutrients, bypass fat and supplements on the blood profiling, meat quality and carcass characteristics, meat nutrient contents and profitability in Kundhi buffaloes.

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