

**THE EFFECT OF SOME ARTIFICIAL FLAVOURS
ON ROUGHAGE CONSUMPTION AND MILK
YIELDS OF BUFFALOES AND FRIESIAN COWS**

By

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Two comparative feeding trials, involving two groups of lactating Friesian cows and buffaloes, of 15 animals each, in three similar lots were carried out in Sakka and Mahallet-Moussa Animal Production Stations of the Ministry of Agriculture. The object was to investigate the effect of supplementing the roughage portion of the ration with two artificial flavours (No. 52815/T and 52901/T) given to lots 2 and 3, respectively, in comparison to control lot 1, on roughage consumption and milk yield.

The Friesian cows in lots 1, 2 and 3 consumed a daily average of 8.60, 8.39 and 8.33 kg. of rice straw. The corresponding averages for buffaloes were 8.56, 8.48 and 8.70 kg. As for milk yield, the Friesian cows produced a daily average of 8.02, 8.15 and 7.74 kg. of 4% FCM in the three lots in the same order. The corresponding averages for buffaloes were 3.77, 4.12 and 4.05 kg. of 7% FCM. The differences among the lots were found to be statistically not significant ($P > 0.05$) for FCM yields in both groups. As for roughage consumption, the differences were found to be highly significant ($P > 0.01$) for Friesian cows and not significant ($P > 0.05$) for buffaloes.

It was concluded that the artificial flavours used, failed to induce the animals to consume more roughage or produce significantly more milk (FCM) than those of the control.

Several attempts have been made to increase the efficiency of feed utilization in pigs and poultry by supplementing the rations with artificial flavours to encourage more feed consumption. Mastrangelo (1964), found that some flavours induced more feed consumption in pigs. Deyoe *et al.* (1964), obtained a highly significant improvement in feed utilization of chicks. However, Sizemore and Lillie (1956), Romoser *et al.* (1958) and Abdel-Salam *et al.* (1968), observed no significant influence on feed intake and feed utilization. With suckling buffalo and Friesian calves, Youssef *et al.* (1968), tried some artificial flavours and found no significant increase in either body-weight gain or feed utilization.

To the best of the authors' knowledge, no work has been done concerning the use of artificial flavours in the rations of dairy cattle. The present investigation is an attempt to fulfil this gap of knowledge, to find out the effect of such supplementation on roughage consumption and milk yields of buffaloes and Friesian cows.

Materials and Methods

This investigation was carried out in Sakha and Mahallet-Mousa Animal Production Stations of the Ministry of Agriculture. It started late in September 1967 and lasted for 12 weeks. Two groups of lactating buffaloes and Friesian cows, each of 15 animals were chosen. They were in their second lactation and had passed their maximum milk yield by nearly two months. Each group of buffaloes and Friesian cows was divided into three similar lots according to their age, live-weight and fat-corrected milk (FCM) yields. All lots in both groups were treated the same for a preliminary period of 4 weeks. At the end of this period, the lots in each group were checked again for similarity and one lot was taken for control while the remaining two lots were given the experimental flavours for a period of 8 weeks in the following order :

Lot 1 : without flavour (control).

Lot 2 : Flavour No. 52815/T.

Lot 3 : Flavour No. 52901/T.

The artificial flavours were provided by Firmenich Co., Geneva. The assigned flavour was added to the roughage portion of the ration at a rate of 50 gms/ton. The object was to improve the palatability of the rice straw which was used as the sole roughage and was offered to the animals ad-lib. A concentrate mixture was given, in addition, to fulfil nearly all the protein and most of the energy requirements of the animals. Ghoneim's feeding standards for dairy cows and buffaloes (1946), were applied for calculating the feed requirements which were adjusted every fortnight to correspond with changes in body weight and FCM. yield. The animals were individually fed and the feeds actually consumed were recorded. The concentrate mixture contained 65% undecorticated cottonseed cake, 20% wheat bran, 12% rice bran, 2% ground lime stone and 1% commercial salt. The whole mixture was cubed with 3% cane molasses.

The animals were hand milked twice daily and milk yields were recorded. A representative all-day milk sample was taken for each animal, every fortnight and the milk fat percentage was determined by Gerber method. To make fair comparison for milk yields of different fat percentages, on an equitable energy basis, individual milk yields of cows were converted into 4% FCM by applying Gaines' formula (1923), (4% FCM = 0.4 milk + 15.0 fat). Likewise, milk yields of buffaloes were converted into 7% FCM by using the formula of Raafat and Saleh (1962), (7% FCM = 0.265 milk + 10.5 fat).

The animals were weighed every fortnight in three consecutive days, in the morning before drinking and feeding and the average of the three weights was recorded for each animal.

Representative samples of the feeds used were taken and analysed by using the A.O.A.C. methods (1950). For calculating the nutritive value of the rice straw and the concentrate mixture, the digestibility coefficients reported, by Abou-Raya (1967), were applied. The proximate analysis and the calculated nutritive value of the feeds used are given in Table 1. Statistical analysis of the data obtained were carried out after Snedecor (1956).

TABLE 1.—PROXIMATE ANALYSIS AND NUTRITIVE VALUE OF FEEDS

| Feed stuffs | Proximate Analysis | | | | | | Nutritive Value | |
|------------------|--------------------|---------------|---------------|--------|-------------|-------|-----------------|--------------|
| | Dry matter | Crude protein | Ether extract | N.F.E. | Crude fibre | Ash | Starch Equiv. | Dig. protein |
| | % | % | % | % | % | % | % | % |
| Concentrate mix. | 91.78 | 16.77 | 4.65 | 44.92 | 16.18 | 9.26 | 53.87 | 13.08 |
| Rice straw . . . | 90.71 | 4.74 | 0.37 | 32.67 | 36.02 | 16.91 | 17.94 | 0.76 |

Results and Discussion

The average daily feed consumption per animal in each lot for both groups of buffaloes and Friesian cows is given in Table 2. The data presented in Table 3 show the average daily milk yield during the successive fortnights of the experiment. The average fat percentage of milk and the average yields of 7% FCM and at 4% FCM for buffaloes and Friesian cows, respectively are also given in the same Table.

TABLE 2.—AVERAGE DAILY FEED CONSUMPTION (KG. / ANIMAL)

| | Lots | Treatments | Feed stuffs | | Nutritive value | |
|-----------------|------|-------------------------|-------------|------------|-----------------|------------|
| | | | Rice straw | Conc. mix. | Starch equiv. | Dig. prot. |
| Friesian cows | 1 | Control | 8.60 | 6.74 | 5.17 | 0.95 |
| | 2 | Flav. No. 52815/T . . . | 8.39 | 6.86 | 5.21 | 0.96 |
| | 3 | Flav. No. 52901/T . . . | 8.33 | 6.70 | 5.10 | 0.94 |
| Buffaloes . . . | 1 | Control | 8.56 | 4.35 | 3.88 | 0.64 |
| | 2 | Flav. No. 52815/T . . . | 8.48 | 4.60 | 4.00 | 0.66 |
| | 3 | Flav. No. 52901/T . . . | 8.70 | 4.70 | 4.09 | 0.68 |

Friesian cows :

Small differences were found among the lots in both roughage and concentrate consumption (Table 2). With rice straw, cows in lots 2 and 3 consumed 2.44 and 3.14%, respectively, less than those in the control lot. As for the concentrate mixture, the second lot consumed 1.78 and 2.39% more than the control and the 3rd lot, respectively. It can be seen, in Table 2 that the cows in the 2nd lot consumed, at the average, more energy (Starch Equivalent S.E.) and protein (Digestible Protein D.P.) than the other two lots. However, the differences were small.

For milk production data (Table 3), it was found that a daily average of 8.02, 8.15 and 7.74 kg. of 4% FCM was produced by the cows in lots 1, 2 and 3, respectively. Cows in lot 2 yielded on the average, 1.62 and 5.30% more FCM than the control and the 3rd lot, respectively.

Though the differences in roughage consumption among the lots appeared to be small, yet the analysis of variance shown in Table 4 indicated that they were statistically highly significant ($P < 0.01$). On the contrary, the differences for the 4% FCM yields were found to be statistically not significant ($P < 0.05$).

The gross efficiency of feed utilization for milk production was calculated from the data of feed consumption (Table 2) and that of milk yield (Table 3). It was found that an average of 1.551, 1.564 and 1.518 kg. of 4% FCM was produced for each 1 kg. of S.E. consumed in the total ration, including maintenance, by lots 1, 2 and 3, respectively. In other words, an average of 0.645, 0.639 and 0.659 kg. of S.E. was used for the production of each 1 kg. of 4% FCM, including maintenance, in the three lots in the same order.

It is clear that the cows in the 2nd lot which were given Flavour No. 52815/T, consumed more energy and protein, produced more 4% FCM and showed to be more efficient in feed utilization than the other two lots. However, the differences were rather small.

Buffaloes :

The data in Table 2 showed that the buffaloes in lot 3 consumed, at the average, 1.64 and 2.59% more rice straw and 8.05 and 2.17% more concentrate than those in lots 1 and 2, respectively. Accordingly, they got 5.41 and 2.25% more energy (S.E.) and 6.25 and 3.03% more protein (D.P.) than the other two lots in the same order.

Concerning, milk yield, it can be seen in Table 3 that the 2nd lot produced the highest daily average of 7% FCM while the control lot was the lowest in this respect. The buffalo in the 2nd lot yielded, at the average, 9.28 and 1.73% more 7% FCM than those in the control and the 3rd lot, respectively. The corresponding daily averages were 4.12, 3.77 and 4.05 kg. of 7% FCM.

TABLE 3.—AVERAGE DAILY MILK YIELD, FAT PERCENTAGE AND FAT-CORRECTED MILK
(4% FCM FOR FRIESIAN COWS AND 7% FCM FOR BUFFALOES)

| Lots | Treatments | 1st fortnight | | | 2nd fortnight | | | 3rd fortnight | | | 4th fortnight | | | Average | | |
|---------------------|---------------------------|---------------|----------|------------|---------------|----------|------------|---------------|----------|------------|---------------|----------|------------|-------------|----------|------------|
| | | Milk kg. | Fat % | FCM kg. | Milk kg. | Fat % | FCM kg. | Milk kg. | Fat % | FCM kg. | Milk kg. | Fat % | FCM kg. | Milk kg. | Fat % | FCM kg. |
| Friesian cows | 1 Control | 10.35 | 3.4 | 9.42 | 8.46 | 3.2 | 7.44 | 8.06 | 3.8 | 7.82 | 7.80 | 3.8 | 7.57 | 8.67 | 3.5 | 8.02 |
| | 2 Flav. 52815/T | 9.83 | 3.5 | 9.09 | 8.54 | 3.5 | 7.90 | 8.18 | 3.8 | 7.93 | 8.14 | 3.6 | 7.65 | 8.67 | 3.6 | 8.15 |
| | 3 Flav. 52901/T | 9.56 | 3.3 | 8.56 | 8.16 | 3.4 | 7.43 | 7.79 | 4.0 | 7.79 | 7.40 | 3.9 | 7.29 | 8.23 | 3.6 | 7.74 |
| Buffaloes | 1 Control | 4.56 | 5.8 | 3.99 | 4.13 | 6.2 | 3.78 | 3.88 | 6.4 | 3.64 | 3.92 | 6.6 | 3.76 | 4.12 | 6.2 | 3.77 |
| | 2 Flav. 52815/T | 4.96 | 6.1 | 4.49 | 4.56 | 6.1 | 4.13 | 4.21 | 6.4 | 3.94 | 4.06 | 6.7 | 3.93 | 4.45 | 6.3 | 4.12 |
| | 3 Flav. 52901/T | 4.74 | 6.0 | 4.24 | 4.34 | 6.4 | 4.07 | 4.08 | 6.4 | 3.82 | 4.12 | 6.9 | 4.08 | 4.32 | 6.4 | 4.05 |

The analysis of variance (Table 4) showed that the differences found in roughage consumption and in 7% FCM yield among the three lots were statistically not significant ($P > 0.05$).

TABLE 4.—ANALYSIS OF VARIANCE

| Source of Variation | Degrees of Freedom | Roughage Consumption | | | FCM Yield | | | |
|---------------------|--------------------|----------------------|--------------|-------|----------------|--------------|-------|------|
| | | Sum of Squares | Mean Squares | F. | Sum of Squares | Mean Squares | F. | |
| Friesian Cows | Lots . . . | 2 | 0.21 | 0.105 | 9.55* | 0.35 | 0.175 | 0.11 |
| | Individuals | 12 | 0.13 | 0.011 | — | 19.06 | 1.588 | — |
| | Total . . . | 14 | 0.34 | | | 19.41 | | |
| Buffaloes . . . | Lots . . . | 2 | 0.12 | 0.060 | 0.77 | 0.34 | 0.170 | 0.26 |
| | Individuals | 12 | 0.93 | 0.078 | — | 7.95 | 0.663 | — |
| | Total . . . | 14 | 1.05 | | | 8.29 | | |

* Significant at 1% level.

Concerning the efficiency of feed utilization, it was found that, on the average, 0.972, 1.030 and 0.990 kg. of 7% FCM were produced for each 1 kg. of S.E. consumed in the total ration, including maintenance, by lots 1, 2 and 3, respectively. In other words, an average of 1.029, 0.971 and 1.010 kg. of S.E. was used, for the production of each 1 kg. of 7% FCM including maintenance in the three lots, in the same order.

It was noticed that the buffaloes in lot 2 which were given Flavour No. 52815/Γ consumed the lowest quantity of roughage, a moderate quantity of both energy and protein. They produced the highest daily average of 7% FCM and showed to be better feed converters than the buffaloes in the other two lots. However, the differences were rather small.

Friesian cows and buffaloes :

Comparing the results of the two groups of Friesian cows and buffaloes, it can be seen that the former consumed on the average, a slightly less quantity of rice straw and considerably more concentrate, energy and protein per day than the latter. This was reflected in the average daily milk yield of the Friesian cows which was nearly double that of the buffaloes. There was little difference in the average live weight between the two groups as buffaloes were only 2.5% heavier than Friesian cows.

Concerning the gross efficiency of feed utilization, it was found that each 1 kg. of S.E. in the total ration was used for the production of approximately 1 kg. of 7% FCM and 1.55 kg. of 4% FCM in buffaloes and Friesian cows, respectively, including maintenance cost. The two groups appeared to be nearly equal in feed conversion as their average daily milk performance per unit of starch equivalent was nearly the same on an equitable energy basis (the calorific value of one kg. of 7% FCM equals that of approximately 1.5 kg. of 4% FCM).

It was interesting to notice that the 2nd lot of animals given Flavour No. 52815/T in both groups of Friesian cows and buffaloes attained the highest daily average of milk (FCM) and were more efficient in feed conversion than the other lots. However, the differences found among the lots were statistically not significant.

It can be concluded, from the present results, under the conditions prevailing during the feeding experiment, that the artificial flavours used, failed to induce the animals to consume more roughage or produce significantly more milk (FCM) than the control.

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تأثير بعض مكسبات الرائحة والطعم الصناعية على استهلاك المواد الخشنة وعلى انتاج اللبن في الجاموس والأبقار الفريزيان

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الملخص

اجريت تجربتا تغذية مقارنة شملت مجموعتين من الأبقار الفريزيان والجاموس الحلوب عدد كل منها 15 حيوانا في ثلاثة مجاميع صغيرة متماثلة وذلك في محطتى الانتاج الحيوانى بسخا ومحلة موسى التابعة لوزارة الزراعة وكان الهدف هو بحث تأثير اضافة نوعين من مكسبات الرائحة والطعم الصناعية (هما رقم 52815/ت ، 52901/ت) الى الجزء الخشن من العليقة للمجموعتين 2 ، 3 على التوالي مقارنة بمجموعة المقارنة رقم 1 وذلك على استهلاك المادة الخشنة وعلى محصول اللبن .

وقد استهلك الأبقار الفريزيان فى المجموعات : 1 ، 2 ، 3 يوميا فى المتوسط 8.6 ، 8.39 ، 8.33 كجم من قش الأرز وكان استهلاك المجموعات المقابلة لها من الجاموس فى المتوسط 8.56 ، 8.48 ، 8.70 كجم وبالنسبة لمحصول اللبن فقد أنتجت الأبقار الفريزيان يوميا فى المتوسط 8.02 ، 8.15 ، 7.74 كجم لبن معدل به 4٪ دهن وذلك فى المجموعات الثلاثة بنفس الترتيب وكان متوسط انتاج المجموعات المقابلة لها من الجاموس 3.77 ، 4.12 ، 4.05 كجم لبن معدل به 7٪ دهن . وقد وجدت الفروق بين المجموعات غير مؤكدة احصائيا بالنسبة لمحصول اللبن المعدل فى الأبقار والجاموس أما بالنسبة لاستهلاك المادة الخشنة فقد وجدت الفروق بين المجموعات مؤكدة جدا بالنسبة للأبقار الفريزيان وغير مؤكدة بالنسبة للجاموس .

ويمكن أن نستخلص أن مكسبات الرائحة والطعم الصناعية المستعملة قد فشلت فى حث الحيوانات على زيادة استهلاك المادة الخشنة وفى رفع محصول اللبن عما فى حيوانات المقارنة .

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