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1. Dairy cattle — Feeding and feeds.

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EFFECTS OF SUPPLEMENTATION RATIONS WITH CRUDE OLIVE CAKE ON MILK PRODUCTIVITY IN DAIRY COWS

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W. ZIADE
N. GHSOUB

SUMMARY

An experiment was conducted on two groups of three Holstein dairy cows in each, which received a diet based on concentrate - straw feeding with a supplement composed either of cottonseed meal (CSM) as control A, or crude olive cake (COC), the residue of the first extraction and oil from olives, as experimental group B. Results obtained show a significant difference (P<0.05) in milk butterfat content of cows given diet A (3.32 ± 0.01%) in comparison with cows given diet B (3.47 ± 0.01%), and significantly higher levels of persistency of lactation (82 ± 2.34% and 98.4 ± 0.44% in A and B respectively).

INTRODUCTION

Materials including fiber, by-products and waste from processing human food, protein of extremely-low value, and non-protein-nitrogen compounds can be used for feeding herbivorous animals (BYERLY, 1978; GRABBE and LAWSON, 1980). The advantage here lies in the fact that materials unused in human feeding can be converted into high-quality animal protein although the conversion efficiency is generally low. Millions of tones of crude fiber are available for animal use but only a small part of it is actually consumed. Unfortunately cellulose is often incorporated into indigestible lignin structures thus reducing overall cellulose utilisation (VAN SOEST, 1982). The digestibility of various lignified materials by ruminants can be increased by chemical treatment (KLOPFENSTEIN et al., 1972; GIHAD et al., 1980).
Crude olive cake has seldom been used in feeding dairy cows, primarily because of the high lignin content which causes negative influence on microflora activity (FAQIH, 1964; TISSERLAND and ALIBEX, 1991). However, the few experiments on digestion in diets containing COC did not show marked disturbances in carbohydrate digestion. There is no evidence of a decrease in ruminal digestibility when these kinds of wastes are added to the diet. Moreover, the digestibility of such untraditional lipids in the small intestine appears high (ANDREWS and LEWIS, 1970).

The recent trends in dairy cow nutrition (increasing the fat content of diets, without the necessity of maintaining a high butterfat content) have stimulated renewed interest in untraditional oils and wastes of oil industry supplementation (DOREAU, 1992).

In this trial, the sequences of COC supplementation on milk productivity in cows have been studied. In order to improve the interpretation of results, this olive cake supplemented diet was compared to a control diet supplemented with cotton seed meal (CSM).

MATERIALS AND METHODS

ANIMALS, EXPERIMENTAL DESIGN AND DIETS

Two groups (Control A and experimental B) of three lactating Holstein cows in each, weighing an average 751 kg in their third lactation were given diets containing either CSM or COC for a period of 12 weeks preceded with 3-4 weeks for adaptation to the diets.

Two diets were fed to the cows. Both diets, Control A and experimental B consisted of 25% wheat straw and 75% concentrates on a dry matter (DM) basis, of maize (20.6%), barley (20.6%), wheat bran (20.6%), soy bean meal (7.2%) and mineral premix (1% of limestone, dicalcium phosphate, magnesium oxide and sodium chloride). Diets A and B were supplemented with 5% (1 kg) of CSM and 5% (1 kg) of COC, respectively. The two diets were fed in amounts so that energy, nitrogen and mineral requirements were met (EE, 3.7%; crude protein, 13.9%, ADF, 16.8%) as recommended by MORRISON (1961), NRC (1971) and MAFF (1975).

The diets including the supplements were fed as a total mixed ration. Cows
were fed twice daily in equal portions.

MEASUREMENTS AND ANALYSIS

During the period of 12 weeks, all six cows were under close observation and control for any health disorders. Milk yield was registered for each cow daily. Butterfat content was tested on monthly basis by the method of «Gerber» (KIRK and SAWYER, 1991a). Persistency of lactation was calculated by the method described by FOLEY et. al. (1973). Samples of feeds were taken, dried for dry matter content by oven-drying at 80°C and used for analyses of ash, NDF (GOERING and VAN SOEST, 1970), crude protein by Kjeldhal method (HANSON, 1973), lipids by Soxhlet extraction apparatus (KIRK and SAWYER, 1991b). Milk samples were tasted occasionally by a panel of at least four persons to detect any changes in flavor resulting from the feeding of the concentrate mixture containing COC. The cost price of diets were calculated and compared. Statistical analysis was performed using Student's t test. Results are expressed as mean ± standard error (X = SE). Significant difference was established at P<0.05 unless otherwise noted.

RESULTS

- Chemical analyses of feeds- Crude protein analysis was lower for COC (6%) in comparison with CSM (23%). ADF and EE contents in COC exceeded CSM by 47 and 188% respectively.

- Palatability of rations and general health- There were no feed refusals for any of the rations at the quantities offered. General health in both experimental and control groups was good.

- Flavor and color of milk- No changes in color or flavor of milk were observed during the 12 weeks of the trial.

- Milk yield and butterfat content- Results in Table 1 show no significant differences in daily average milk production (14.06 and 13.66 kg of milk/day in A and B respectively), while butterfat content in the overall average increased significantly in milk of group B (3.32 Vs 3.47%).

- Persistency of lactation- Results in Table 2 show that, level of milk production in group B during the second (95%) and third (98%) months of trial was significantly persistent (P<0.05) in comparison with milk yield at the beginning of the trial, where as milk yield in group A significantly declined (82% for the same periods).
- Ration Cost-price- This indicator in group B (2.45$ USA/cow/day) was at 9.3% less than diet fed to cows of the control A (2.71$ USA/cow/day).

DISCUSSION

Diets given to both groups contained the same quantity of nutrients. There was no significant effect on daily milk yield, flavor and color of milk, even though other workers have expressed concern over the possibility of effects on milk yield when COC was used in diets as replacement for barley (FAQIH, 1964). There was no difference in palatability of rations and the general health of the animals in both groups which reflects the fact that, COC can be consumed by animals without negative side effect providing good health conditions (PHILOPOVICH, 1984). It was noticed a significant difference (P<0.05) in the overall average of butterfat content in milk and persistency of lactation at the end of the trial where it was higher in group B in comparison with the control. This can be explained by the fact that COC is considered a good source of essential fatty and amino acids and wide group of vitamins which make this ingredient better than CSM in repairing and rebuilding the animal physiology and metabolism (MORRISON, 1961; TANNENBAUM and PACE, 1976; SAC, 1978). Besides that significant physiological effect, feeding mixtures supplemented with COC in replacement for CSM gives higher profits by decreasing the ration cost-price.
Table 1. Average daily milk production (kg) and butterfat content of milk (%)

<table>
<thead>
<tr>
<th>Periods</th>
<th>Control A</th>
<th>Experimental B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Milk, kg</td>
<td>Butterfat, %</td>
</tr>
<tr>
<td>At the beginning of the experiment</td>
<td>17.17±3.61</td>
<td>3.3±0.1</td>
</tr>
<tr>
<td>Average for the first month of the trial</td>
<td>15.47±3.63</td>
<td>3.3±0.09</td>
</tr>
<tr>
<td>Average for the 2nd month of the trial</td>
<td>12.90±3.42</td>
<td>3.33±0.09</td>
</tr>
<tr>
<td>Average for the 3rd month of the trial</td>
<td>10.72±3.16</td>
<td>3.36±0.09</td>
</tr>
<tr>
<td>Overall daily average</td>
<td>14.06±1.42</td>
<td>3.32±0.01\textsuperscript{a}</td>
</tr>
<tr>
<td>Average milk per cow for the three months of trial</td>
<td>1092.7±286.2</td>
<td>36.28 kg</td>
</tr>
<tr>
<td>Average butterfat per cow for the three months of trial</td>
<td>36.28 (kg)</td>
<td>39.05 (kg)</td>
</tr>
</tbody>
</table>

Results are expressed as mean ± standard error (X ± SE).
\textsuperscript{ab} means on the same row with different superscripts differ significantly (P < 0.05).

Table 2. Changes in Persistency of Lactation %

<table>
<thead>
<tr>
<th>Periods</th>
<th>Control A</th>
<th>Experimental B</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the beginning of the experiment</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Persistency for the first month of the trial</td>
<td>89.9±4.67</td>
<td>97.8±1.33</td>
</tr>
<tr>
<td>Persistency for the 2nd month of the trial</td>
<td>82.0±2.55\textsuperscript{a}</td>
<td>95.3±1.20\textsuperscript{b}</td>
</tr>
<tr>
<td>Persistency for the 3rd month of the trial</td>
<td>82.0±2.34\textsuperscript{a}</td>
<td>98.4±0.44\textsuperscript{b}</td>
</tr>
</tbody>
</table>

Results are expressed as:
± means standard error (X ± SE).
\textsuperscript{ab} Means on the same row with different superscripts differ significantly (P < 0.05).
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