Dried Distillers Grain byproduct improves the fatty acid profile of ewe milk in Chios sheep

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Feedstuffs in Cyprus are
• not enough and therefore imported
• the most crucial constrain for successful production in dairy industry
- there is a need for alternative feeds

Why to do research on that subject in Cyprus?
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The most important agricultural export of Cyprus is halloumi cheese.

Halloumi cheese is:
- made mainly from sheep and goat milk
- is rich in fat (41% on DM basis)

There is a need from the dairy industry to improve the fat profile of sheep milk.
What is “Dried Distillers Grains with Solubles (DDGS)”

- Is the dried residue remaining after the starch fermentation with selected yeasts and enzymes to produce bio-ethanol

The main difference from the grain
- starch
- protein
- fat
- fiber
- yeast

Could we use this by-product for the improvement of sheep milk production and dairy lipids?
Material and methods

45 Chios ewes in mid-lactation were housed indoors and allocated to 3 iso-energetic and iso-nitrogenous feeding regimes:

- **G0 group**: no inclusion of DDGS
- **G10 group**: 10% inclusion of DDGS
- **G20 group**: 20% inclusion of DDGS on DM basis

The experiment lasted for 9 weeks and BW, milk yield, feed intake were measured, whilst milk samples were taken during the first 5 weeks for analysis.
<table>
<thead>
<tr>
<th>Diet ingredients, % of DM</th>
<th>G0</th>
<th>G10</th>
<th>G20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley grain</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Corn grain</td>
<td>30,2</td>
<td>26,5</td>
<td>22,3</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Sugar beet pulp</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Soya meal 47%</td>
<td>14</td>
<td>7,8</td>
<td>2</td>
</tr>
<tr>
<td>MCP (monocalcium phosphate)</td>
<td>0,2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vitamins and micro minerals</td>
<td>0,2</td>
<td>0,2</td>
<td>0,2</td>
</tr>
<tr>
<td>Sunflower 35%</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>DDGS from wheat</td>
<td>0</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>ðegO</td>
<td>0,2</td>
<td>0,2</td>
<td>0,2</td>
</tr>
<tr>
<td>Sodium Biocarbonate</td>
<td>0,8</td>
<td>0,8</td>
<td>0,8</td>
</tr>
<tr>
<td>Limestone</td>
<td>2,2</td>
<td>2,3</td>
<td>2,3</td>
</tr>
<tr>
<td>Salt</td>
<td>0,2</td>
<td>0,2</td>
<td>0,2</td>
</tr>
</tbody>
</table>

1.8 kg concentrate
1.2 kg barley hay per animal
<table>
<thead>
<tr>
<th>Chemical composition, % DM</th>
<th>G0</th>
<th>G10</th>
<th>G20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protein</strong></td>
<td>14,88</td>
<td>14,46</td>
<td>14,96</td>
</tr>
<tr>
<td><strong>Cfibre</strong></td>
<td>15,44</td>
<td>15,71</td>
<td>16,20</td>
</tr>
<tr>
<td><strong>Ash</strong></td>
<td>6,32</td>
<td>6,39</td>
<td>6,72</td>
</tr>
<tr>
<td><strong>Fat</strong></td>
<td>2,45</td>
<td>2,80</td>
<td>2,70</td>
</tr>
<tr>
<td><strong>Ca</strong></td>
<td>0,77</td>
<td>0,77</td>
<td>0,78</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>0,41</td>
<td>0,40</td>
<td>0,45</td>
</tr>
<tr>
<td><strong>Na</strong></td>
<td>0,30</td>
<td>0,31</td>
<td>0,31</td>
</tr>
<tr>
<td><strong>Cl</strong></td>
<td>0,42</td>
<td>0,42</td>
<td>0,43</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>0,19</td>
<td>0,20</td>
<td>0,20</td>
</tr>
<tr>
<td><strong>Mg %</strong></td>
<td>0,29</td>
<td>0,30</td>
<td>0,31</td>
</tr>
<tr>
<td><strong>K %</strong></td>
<td>1,46</td>
<td>1,40</td>
<td>1,36</td>
</tr>
<tr>
<td><strong>ME MJ Rum.</strong></td>
<td>10,92</td>
<td>10,95</td>
<td>10,91</td>
</tr>
<tr>
<td><strong>NDF%</strong></td>
<td>34,6</td>
<td>36,5</td>
<td>39,4</td>
</tr>
<tr>
<td><strong>ADF%</strong></td>
<td>19,1</td>
<td>20,0</td>
<td>20,8</td>
</tr>
<tr>
<td><strong>% DM</strong></td>
<td>88,00</td>
<td>88,00</td>
<td>88,00</td>
</tr>
</tbody>
</table>
Results on body weight

Error bars are standard error of the mean, ***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

No differences on weight
Results on daily milk yield

No differences on daily milk yield

Error bars are standard error of the mean, ***P < 0.001, **P < 0.01, *P < 0.05
Results on milk yield for 9 weeks (lt per ewe)

There was only a tendency of increased total milk yield with the inclusion of DDGS.
Results on milk constituents

No differences on milk protein

Error bars are standard error of the mean.
Results on milk constituents

Error bars are standard error of the mean.

No differences on milk lactose
Results on milk constituents

Error bars are standard error of the mean, ***P < 0.001, **P < 0.01, *P < 0.05
Results on production and main milk components

The inclusion of DDGS in lactating sheep did not affect
- milk yield
- feed consumption
- milk constituents apart from fat

What about the quality of fat (fatty acid profile)?
Results on fatty acid profile of feed

Error bars are standard error of the mean, ***P < 0.001, **P < 0.01, *P < 0.05
Results on fatty acid profile

Error bars are standard error of the mean, ***P < 0.001, **P < 0.01, *P < 0.05
Results on fatty acid profile

Sum of mono-unsaturated FA

Error bars are standard error of the mean, ***P < 0.001, **P < 0.01, *P < 0.05
Results on fatty acid profile

Error bars are standard error of the mean, ***P < 0.001, **P < 0.01, *P < 0.05
Results on fatty acid profile

Error bars are standard error of the mean, ***P < 0.001, **P < 0.01, *P < 0.05
Results on fatty acid profile

![Graph showing c9,t11 18:2 CLA content over weeks of sampling. Error bars are standard error of the mean. ***P < 0.001, **P < 0.01, *P < 0.05.]
Results on fatty acid profile

Error bars are standard error of the mean, ***P < 0.001, **P < 0.01, *P < 0.05
Conclusion regarding DDGS use in dairy sheep

The inclusion of DDGS in lactating sheep affected
- The fat content of milk
- The unsaturation index of ovine milk
- Particular FA, beneficial for human health, were increased (i.e. linoleic, CLA)

It is a cheap alternative to soya beans for sheep farmers without any advert effects on feed consumption or production when it is used up to 20% inclusion.
Acknowledgments

My colleagues

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- Mrs Constantina Constantinou
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- Dr Miltiades Hadjipanayiotou
- Dr Christakis Papachristoforou

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Thank you for your attention!