Fermentation strategies for the valorisations of Olive cake to improve their nutritional value in Broiler’s feeds
Hassan. A. F. Rahmy¹, Salma Nour El-Deen², Fatma Mohamed Abosamra², Abdalla Saied Mohamed Korayem³

¹ Department of Animal Production, Faculty of Agriculture, Cairo University, Egypt
² Faculty of Organic Agriculture Heliopolis University for Sustainable Development
³ Agricultural microbiology department, Faculty of Agriculture, Ain Shams University, Egypt
Presented by
Hassan Awny Fouad Rahmy
lecturer
Fac. of organic Agric. Heliopolis Univ.
Member of the Community Service and Environmental Development Committee – Fac. of Agric. - Cairo Univ.
Member of the Animal Ethics Committee - Cairo Univ.
International trainer - Missouri State University – USA.
Scientific Supervisor of the Cows, Buffaloes, Sheep, and Goats Unit at the Agric. Experiments and Research Station Fac. of Agric. - Cairo Univ.
Manager of Moktar Farm For Agriculture Sector- Giza.

22/6/2023
Introduction
Objective
Material and Method
Result
Conclusion
Introduction
Olive tree in Egypt

Egypt recently announced an ambitious plan to **plant 100 million olive trees by 2022**.

Egypt's production of olive oil is forecast to reach 42,200 tonnes in 2026, up 3.4% from 34,500 tonnes in 2021. Since 2006, production has grown 10.4% annually. The country ranked 10th in 2021, behind Argentina. Greece, Italy, and Tunisia were the top three in terms of production.
Raw material
2 main raw material

CRISIS
SOLUTION

CHANIA 2023 Conference
Objective
• The development and adoption of alternative animal feeds setting up a circular economy approach in the livestock production by turning the by-products of the food industry into high value secondary feedstuff for animal feed.
• The project also focusses on the increase of the sustainability of the Mediterranean livestock through the valorization of local food industry byproducts that will lead to reduced environmental impact and costs
3 Parts

- Lab. Scale Fermentation
- Large Scale Fermentation
- Bird Trail
Olive Cake

Olive Cake is an olive oil industry by-product that is available in large quantities, especially in the Mediterranean Sea region.

The challenge in our Case Study is how to improve the nutritional value of the Olive Cake with its high fiber content to be used in poultry feeding.
Sample collection and chemical analysis
The chemical composition of the Untreated olive cake OC

<table>
<thead>
<tr>
<th>Untreated OC % (DM)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>3.43</td>
</tr>
<tr>
<td>CP</td>
<td>6.53</td>
</tr>
<tr>
<td>CF</td>
<td>45.25</td>
</tr>
<tr>
<td>EE</td>
<td>14.77</td>
</tr>
<tr>
<td>NFE</td>
<td>35.19</td>
</tr>
<tr>
<td>NDF</td>
<td>91.77</td>
</tr>
<tr>
<td>ADF</td>
<td>74.26</td>
</tr>
<tr>
<td>ADL</td>
<td>41.74</td>
</tr>
<tr>
<td>HEMI.</td>
<td>17.83</td>
</tr>
<tr>
<td>CELL.</td>
<td>32.19</td>
</tr>
<tr>
<td>LIGN.</td>
<td>39.78</td>
</tr>
<tr>
<td>GE cal/Kg</td>
<td>4613</td>
</tr>
</tbody>
</table>
Lab Scale Valorization of Olive Cake.....

The most promising microbial isolate
Optimization and Identification
Lab Scale Valorization of Olive Cake.....

The **Mold** isolate that exhibit the best results of degradation of the crude fiber through solid-state fermentation was optimized for the following parameters in the lab to be used on the large/Pilot scale.

- **Nitrogen Source**
- **Fermentation Temperature & Period**
- **pH**
- **Inoculum Size**
Solid-State Fermentation Conditions Based on the Optimization of the best Results:

- **Nitrogen Source**
  - Beef Extract
  - Penton
  - KNO3

- **pH Value**
  - 6, 7, 8 & 9

- **Incubation Temperature & Period**
  - 25, 28, 30, 32 & 35°C
  - for 3, 7, 14 & 21 Days

- **Inoculum Size**
  - 1, 2, 3, 4 & 5%
Mold Isolate Identification

Molecular Identification was done for the mold isolate using ITS gene sequencing.
Biological evaluation on birds
24 Mature roosters were divided randomly into eight equal treatments each divided into Four equal replicates.

UTOC:- Untreated Olive cake (Control), T1, T2:-(Bacterial Isolates), T3 (Yeast Isolate) and T4:-(Mold Isolate) T5:- (Consortium of T3 +T4).
Collection of the dropping
Lab. Scale drying then wt. then analysis
Chemical analysis for the Fermented and un-fermented Olive Cake (on DM basis).
Optimization medium composition for the valorization of olive cake under solid-state fermentation.
Best Solid-State Fermentation Conditions based on the Optimization Results:

- Nitrogen Source
- pH Value: 6
- Incubation Temperature & Period: 28°C for 14 Days
- Inoculum Size: 3%
The diagram illustrates the effect of incubation temperature on the percentage of crude fibers and crude protein. The temperatures are 25°C, 28°C, 30°C, 32°C, and 35°C. The percentage is shown for each temperature level, with different letters indicating statistical significance.
Mold Isolate Identification

Molecular Identification was done for the mold isolate using ITS gene sequencing.
Aspergillus oryzae
Biological evaluation
Result of First Digestibility trail

Raw material

Table2. Gross energy (GE), apparent metabolizable energy (AME) values (cal/Kg) of treated olive cake.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>GE</th>
<th>AME</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTOC</td>
<td>4613&lt;sup&gt;C&lt;/sup&gt;</td>
<td>2226&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>T1</td>
<td>4663&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2214&lt;sup&gt;C&lt;/sup&gt;</td>
</tr>
<tr>
<td>T2</td>
<td>4838&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2367&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>T3</td>
<td>4778&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2226&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>T4</td>
<td>4762&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2214&lt;sup&gt;C&lt;/sup&gt;</td>
</tr>
<tr>
<td>T5 (Consortium of T3 + T4)</td>
<td>4784&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2367&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

UTOC, Untreated Olive cake, T1, T2 (Bacterial Isolates) T3 (Yeast Isolate) and T4 (Mold Isolate) T5(Consortium of T3 + T4).
Feed evaluation
Conclusion
According to the findings in this study

• OC is a valuable ingredient and may be included in broiler diets.
• Furthermore, these findings support modifying the composition of agricultural by-products to make them more suitable for use in poultry feed.
• leading to a significant reduction in the feeding cost, improving economic returns, and decreasing environmental pollution.
Conclusion

- The Solid-state fermentation (SSF) could be an effective pre-treatment for OC, which could significantly improve available nutrient content.
- In addition, a combination of different treatments may lead to higher digestibility and quality processes of the end product.
Acknowledgements

The research leading to these results has received funding from the European Union’s PRIMA Program for Research, Technological Development, and Demonstration under grant agreement n°2013 and the Basque Country government through the FEADER funds.
Thank you

Any Questions?