

Valorization of Olive Cake as a By-product as a Solution for Olive waste and validating the obtained ingredients with Poultry.

Hassan. A. F. Rahmy^{1,2}, Salma Nour El-Deen¹, Fatma M. Abosamra¹, Adel M. Khaled¹, Abdalla S. M. Korayema^{3,1}

¹ Faculty of Organic Agriculture Heliopolis University for Sustainable Development

² Department of Animal Production, Faculty of Agriculture, Cairo University, Egypt

³ Agricultural microbiology department, Faculty of Agriculture, Ain Shams University, 11241 Qalubia, Egypt.

Keywords: Crude Fiber; olive cake; Circular economy; Broiler feed

Presenting author email: Hassan.Awny@hu.edu.eg

Introduction

The olive tree (*Olea europaea* L.) is grown in the Mediterranean region to produce edible olive oil and table olives. Olive oil has been recognised for many generations as a vital ingredient of a Mediterranean diet, and consumers in Europe and many other countries today value it for its distinct flavour and nutritional qualities (Frankel et al., 2013). Over two-thirds of the world's olive oil production comes from the European Union, which is the top producer. According to the European Commission (2017), 99% of the olive oil produced in the EU comes from four member states: Spain, Italy, Greece, and Portugal.

A variety of by-products from the manufacture of olive oil can be fed to animals. The following are examples of by-products of the extraction of olive oil: olive pulp, vegetative waters, and leaves; crude and exhausted olive cakes; and partially destoned olive cakes.

According to Jabri et al. (2017), olive trees are abundant in phenolic compounds with significant biological activity, the most prominent of which is oleuropein. The beneficial effects of oleuropein, olive leaf extracts (OLE), and olive leaf powder (OLP) on poultry performance have been assessed by numerous scientific studies (Erener et al., 2020). Numerous antioxidants found in olive tree fruit (Kalogeropoulos and Tsimidou, 2014) and byproducts (Botsoglou et al., 2013; King et al., 2014; Gerasopoulos et al., 2015) may be able to scavenge free radicals and offer antioxidant protection.

A "zero waste" economy, where waste from raw materials is used to create new products and applications, is the goal of agricultural innovation (Mirabella et al., 2014). However, the rapidly growing chicken raising sector significantly increases feed consumption and expenses. In the chicken industry, feed expenditures make up more than 70% of production costs (Mikail et al., 2021).

Over the past several decades, there has been a notable growth in the number of studies utilising natural herbs to improve the performance of broiler chickens (Abd El-Hack et al., 2022a ; Rafeeq et al., 2023).

According to earlier studies, including products from the olive sector in broiler diets may, but only to a small extent, negatively affect growth performance metrics (Sayehban et al., 2020). The purpose of this study was to adding herbal and aromatic plants and by bio-transform and valorise olive cake, a byproduct of the Egyptian olive industry, using solid-state fermentation technology to enhance the nutritional content of chicken feed. Allowing the complex fibers—lignin, cellulose, and hemicellulose—found in olive cake to decompose and be ingested by birds is the problem here

Materials and methods

To raise the value of chicken feed, the study sought to bio-transform and valorise olive cake, a byproduct of the Egyptian olive industry, using solid-state fermentation technology. Here, the objective is to facilitate birds' digestion of the complex fibres (lignin, cellulose, and hemicellulose) in the olive cake.

The aromatic and herbal plants, as well as the by-product (olive cake), were supplied by the ISIS and SEKEM Company (Agricultural Seeds, Herbs and Plants Mixed Spices, Belbis, Sharkia Governorate, Egypt). In this trial, three types of aromatic herbs—mint, chamomile, and lemongrass—were mixed together and added to treatment 2's diet at a rate of 4%.

Using the Official Methods of the Association of Official Analytical Chemists (AOAC), the nutritional value of the substances was ascertained. The standards for handling and keeping animals were then approved by Cairo University's Institutional Animal Care and Use Committee (CU-IACUC). Similar growing circumstances were used for feeding tests with the broilers in floor pens. There was always water and pelleted feed. The experimental diet included olive cake, while the control food was given to the broilers. Growing meals that contained 23% crude protein were fed to

broilers. Additionally, look into how output affects blood parameters, feed intake, growth rate, the European production index, and economic efficiency.

Results and discussion

The administration of aromatic and herbal plants considerably raised the growth rate and output index, regardless of the amount of OC. There was no discernible change in feed intake, growth rate, or the European production index when 10, 20, 30, 40, and 50% OC were added to broiler diets. Furthermore, regardless of OC level, supplementing with herbal and aromatic components resulted in a considerable rise in the growth rate of the European production index. The birds' blood parameters were significantly impacted when meals containing OC were supplemented with aromatic and herbal components. Moreover, OC reduces feed expenses in broiler-fed diets.

Conclusions

It is advised that some of the leftover olives that people do not eat be utilised as an alternative source of feed additives for poultry, even though the price of chicken rations is increasing and animals are vying for human attention. Because olive byproducts can be added to grill rations without compromising the animals' health, performance, digestibility, scent, or nutritional value, rations are provided when the right processing methods are used. Businesses will benefit from reduced feed costs due to the economical and effective use of these wastes. Utilising these wastes as a feed component in broiler rations, together with appropriate processing techniques, has been found to enhance broiler growth performance, reduce overall broiler production costs, and reduce the quantity of pollutants released into the environment.

Acknowledge

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 Basque Country government through the FEADER funds.

References

- Abd El-Hack, M. E., M. T. El-Saadony, A. R. Elbestawy, A. Nahed, A. M. Saad, H. M. Salem, and K. A. El-Tarabily. (2022).** Necrotic enteritis in broiler chickens: disease characteristics and prevention using organic antibiotic alternatives—a comprehensive review. *Poult. Sci.* 101:101590.
- Botsoglou E, Govaris A, Fletouris D, and Iliadis S (2013).** Olive leaves (*Olea europea* L.) and α -tocopheryl acetate as feed antioxidants for improving the oxidative stability of α -linolenic acid-enriched eggs. *J Anim Physiol Anim Nutr* 97:740-753.
- Erener, G., N. Ocak, E. Ozturk, S. Cankaya, R. Ozkanca, and A. Altop. 2020.** Evaluation of olive leaf extract as a growth promoter on the performance, blood biochemical parameters, and caecal microflora of broiler chickens. *Rev. Bras. Zootec.* 49:e20180300.
- European Commission (2017).** EU Agricultural outlook for the agricultural markets and income 2017-2030. Accessed 13 February 2018. https://ec.europa.eu/agriculture/sites/agriculture/files/markets-and-prices/medium-term-outlook/2017/2017-fullrep_en.pdf
- Frankel E, Bakhouch A, Lozano-Sánchez J, Segura-Carretero A, and Fernán dez-Gutiérrez A (2013)** Literature review on production process to obtain extra virgin olive oil enriched in bioactive compounds. Potential use of byproducts as alternative sources of polyphenols. *J Agric Food Chem* 61:5179-5188.
- Gerasopoulos K, Stagos D, Kokkas S, Petrotos K, Kantas D, Goulas P, and Kouretas D (2015).** Feed supplemented with byproducts from olive oil mill wastewater processing increases antioxidant capacity in broiler chickens. *Food Chem Toxicol* 82:42-49.
- Jabri,J.,H., Kacem,H., Yaich,K., Abid,M.Kamoun, J.Rekhis, and A. Malek. 2017.** Effect of olive leaves extract supplementation in drinking water on zootechnical performances and cecal microbiota balance of broiler chickens. *J. New Sci. Sus. Livest. Manag.* 4:69–75.
- Kalogeropoulos N, and Tsimidou MZ (2014).** Antioxidants in Greek virgin olive oils. *Antioxidants* 3:387-413.

King AJ, Griffin JK, and Roslan F (2014). In vivo and in vitro addition of dried olive extract in poultry. *J Agric Food Chem* 62:7915-7919.

Mikail Y., Ayşe G. F. and Gökhan F. 2021. the effect of olive wastes for poultry feed on growth performance of broilers: a review. *J. Glob. Innov. Agric. Sci.*, 9(4):163-166

Mirabella, N., V. Castellani, S. Sala. 2014. Current options for the valorization of food manufacturing waste: a review. *J. Clean. Prod.* 65:28-41.

Rafeeq, M., R. M. Bilal, F. Batool, K. Yameen, M. R. Farag, M. Madkour, and M. Alagawany. (2023). Application of herbs and their derivatives in broiler chickens: a review. *Worlds Poult. Sci. J.* 79:95–117.

Sayehban, P., A. Seidavi, M. Dadashbeiki, A. Ghorbani, W. A. G. de Araújo, A. Durazzo, M. Lucarini, P. Gabrielli, B. Omri, L. F. T. Albino, E. B. Souto and A. Santini. 2020. Olive Pulp and Exogenous Enzymes Feed Supplementation Effect on the Carcass and Offal in Broilers: A Preliminary Study. *Agriculture.* 10:359.