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ANIMAL WELFARE: ESSENTIAL OILS AS AN INNOVATIVE APPROACH IN MODERN ANIMAL FARMING (VETERINARY MEDICINE)

Introduction. In today's world of rapid change and constant development, animal welfare issues in agriculture and livestock production are becoming an integral part of public dialogue. In light of this, finding innovative approaches to providing animal comfort and care is an urgent challenge for veterinary science and practice.

The conventional challenges contemporary animal farming faces, spanning concerns related to stress, disease prevention, and overall health, underscore the need for holistic and sustainable solutions. In this context, essential oils (EOs) emerge as a potentially revolutionary tool for improving livestock farming conditions and ensuring optimal animal welfare.

Currently, more than 3,000 EOs are known and are potential reservoirs of many biologically active compounds and have many useful properties [4]. Essential oils have a wide range of biological activities due to their complex chemical compositions that may be useful in treating and maintaining animal welfare and health. EOs are known for their diverse biological activities, including antimicrobial, anti-inflammatory, analgesic, and calming effects [6, 7].

The purpose of this article is to provide a comprehensive analysis and exploration of the potential of essential oils as an innovative approach to improving animal welfare in modern livestock production, with a focus on veterinary aspects.

Materials and Methods. Methodological research tools include a systematic approach. Wherein the bibliographic Web of Science <https://clarivate.com/cis/solutions/web-of-science/> and Scopus article content database PubMed: <https://pubmed.ncbi.nlm.nih.gov/>, Google Scholar: <https://scholar.google.com/> for the last 10 years. As a result, they selected the most

relevant and important publications in peer-reviewed journals on research topics. Various publications were combined into appropriate groups. This made it possible to specify the essence and identify the main areas and concepts for future studies on animal welfare and the use of essential oils in modern animal farming. This is a crucial step in guiding further research efforts. At this stage, we are going to conduct research on the antioxidant and antibacterial activity of essential oils.

Results. There are several key essential oils that are commonly used in veterinary medicine to promote animal health and address various conditions. The antibacterial properties of essential oils make them valuable in animal husbandry and veterinary medicine for combating bacterial infections in animals. The most promising oils are: Tea Tree Oil (*Melaleuca alternifolia* Cheel), Oregano Oil (*Origanum vulgare* L.), Lavender Oil (*Lavandula angustifolia* Mill.), Eucalyptus Oil (*Eucalyptus globulus* Labill.), Thyme Oil (*Thymus vulgaris* L.), Rosemary Oil (*Rosmarinus officinalis* L.), Chamomile Oil (*Chamomilla recutita* (L.) Rauschert), Cinnamon Oil (*Cinnamomum verum* J.Presl), Garlic Oil (*Allium sativum* L.), Peppermint Oil (*Mentha piperita* L.).

There is evidence that the use of essential oils in agricultural feeding farm animals contributes to improving their health and increases productivity research. This is due to the fact that essential oils have antimicrobial, antioxidant, antiparasitic, anti-inflammatory scorching, and antifungal properties [2-4, 8, 10]. Studies conducted by Burt (2004) in vitro demonstrated the antibacterial activity of EOs against several pathogens such as *Listeria monocytogenes*, *Salmonella typhimurium*, *Escherichia coli*, and *Staphylococcus aureus*, among others [5]. However, our analyses indicated a small number of in vivo experiments on the use of essential oils in the treatment of mastitis. Thus, Abboud and co-workers (2011) studied the effect of a 10% mixture of *Thymus vulgaris* L. and *Lavandula angustifolia* Mill., by intramammary infusion and external use [2]. The other side study assessed the antimicrobial effects of rosemary and eucalyptus essential oils in bird diets to reduce the risk of coccidiosis supporting bird health and preventing disease [9, 12].

Essential oils with antimicrobial properties, such as eucalyptus, tea tree, and peppermint, can be used to improve respiratory function in animals and prevent respiratory infections. Essential oils such as Echinacea or Thyme can help strengthen animals' immune systems, making them more resistant to infections. EOs of lavender, tea tree, and rosemary can be used to antiseptically care for pet skin, preventing various skin problems. To reduce stress in animals, essential oils of lavender and lemon balm are used, which in turn helps maintain their health.

Antimicrobial resistance is a fundamental issue in animal health and welfare, nutrition, and human health and is a cornerstone of One Health's conception. The increasing level of antimicrobial resistance of bacterial pathogens is a problem of

global importance. Antimicrobial drugs are widely used in animal husbandry, treatment, and prevention of bacterial infections, and in subtherapeutic doses to promote growth, although the use of antibiotic growth promoters in food-producing animals has been banned in the European Union (EU) since 2006. It was proposed alternative natural products, such as medicinal plants, essential oils (EOs), and herbal extracts are regarded as promising alternative agents.

EOs derived from different plants are a source of natural antioxidants [3]. Most EOs have the virtue of being non-toxic – the literature has demonstrated that, 16 of 36 to inorganic supplements, plant-derived products such as EOs are less toxic, residue-free, and thought to be ideal growth promoters for both milk and beef production and quality [3].

The antioxidant mechanism of EOs is based on their ability to supply hydrogen or electrons to free radicals and their ability to displace unpaired electrons in the aromatic structure, thereby protecting other biomolecules from oxidation. Compared to vitamin E, vitamin C, and carotenoids, phenols are more effective antioxidants [9, 11, 12]. Researchers found that a mixture of essential oils, including carvacrol, cinnamaldehyde, and capsicum essential oil, could increase the concentrations of carotenoids and coenzyme Q10 in the liver of broilers, thereby exhibiting antioxidant potential [12].

Conclusion. Contemporary livestock production grapples with various challenges related to animal health and welfare, such as the emergence of antimicrobial resistance. In response, we have explored an innovative approach centered around the use of essential oils as an alternative solution. We posit that essential oils hold significant promise in promoting and effectively safeguarding both animal welfare and health.

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