

REVIEW ARTICLE

Ocimum Sanctum: a Natural feed additive

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ABSTRACT

Feed additives are a category of nutrient and non-nutrient compounds that tend to increase feed consumption efficiency and thereby reduce high feed costs. Nowadays, the use of herbal feed additives is gaining production significance due to the ban on the use of certain antibiotics due to their adverse residual effects. There are a variety of medicinal herbs that may be utilized as natural feed additives, with tulsi gaining a lot of attention from researchers. For its remarkable therapeutic qualities, *Ocimum sanctum* (Tulsi) has been revered in virtually all ancient ayurveda literature. It has a pungent and bitter flavour, as well as a hot, light, and dry impact. Its seeds are thought to provide a cold impact. Tulsi's roots, leaves, and seeds have a variety of therapeutic qualities. Tulsi has Antioxidant activity, Antibacterial activity, Antifungal activity, Immunomodulatory activity, Antihypertensive and cardioprotective activities, Antiviral properties, Analgesic activity & accelerates growth response of the birds etc.

KEYWORDS- Feed additive, Herbs, Tulsi, Growth

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INTRODUCTION

Plants are one of the most significant sources of medicine today, and medicinal plants provide various secondary metabolites and essential oils [1]. On the one hand, medicinal plants have proven to be cost-efficient and effective, and they are also readily available and safe to use [2, 3]. There are several sources of various medicinal plants that may be utilized as natural feed additives, tulsi is one of them.

Tulsi is a very important emblem of the Hindu holy culture. Known as Holy Basil in English and botanically called *Ocimum sanctum*, Tulsi belongs to the *Lamiaceae* family of plants. It is an upright, branched, fragrant plant that typically reaches a height of around 30-60cm when mature. Tulsi flowers are tiny and purple, growing in elongate racemes in tight whorls. The fruits are tiny, and the seeds are a bright reddish-yellow colour. Tulsi is a tropical and warm-climate plant that grows naturally. The plant is grown and supplied all throughout India. Due to its wide range of therapeutic qualities, it has made a significant contribution to science both in ancient times and in current study. Aromatic, stomachic, carminative, demulcent, diaphoretic, diuretic, expectorant, alexiteric, vermifuge, and febrifuge qualities are also present in it [4]. In light of this information, a review of the numerous pharmacological activities of *Ocimum sanctum* has been attempted based on experimental and clinical research described in various literatures. Various parts of this herb, such as leaves, seeds and stems, are used for the prevention and cure of many diseases in Ayurveda and Siddha Systems of Medicine.

Kingdom- Plantae

Order- Lamiales

Family- Lamiaceae

Genus- *Ocimum*

Species- *O. tenuiflorum*

Synonym- *O. tenuiflorum*

Common names: English: Holy basil

Hindi: Tulsi, Vishnu priya

COMPOSITION

Tulsi includes eugenol (1-hydroxy 2-methoxy 4-allyl benzene), a phenolic molecule, and ursolic acid, both of which have pharmacological effects, according to Prakash and Gupta [5]. Tulsi has the following chemical constituents: oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, beta-caryophyllene (approximately 8%), and germacrene D. (approximately 2%) [6].

TRADITIONAL USES

Tulsi, as it encourages longevity, is also known as "the elixir of life". Different parts of tulsi are used in Ayurvedic and Siddha Systems of Medicine for the prevention and treatment of many illnesses and everyday ailments such as common colds, headaches, coughs, flu, fever, colic pain, bronchitis, asthma, hepatic diseases, malaria fever, flatulence, migraine headaches, fatigue, skin diseases, wounds, insomnia, arthritis, digestive disorders, night blindness, diarrhoea, and influenza.

Antioxidant Activity- A lot of workers has documented the antioxidant function of Tulsi [2, 7, 8, 9]. The antioxidant effects and association of flavonoids to the membrane Security was observed [10]. The antioxidant activity of in vivo flavonoids (orientin and vicenin) was reflected in a substantial decrease in lipid peroxidation caused by radiation in the mouse liver [11].

According to Reddy *et al.* [12], dietary supplementation of Tulsi (*Ocimum sanctum*) leaf powder (0.5 percent) in broiler chickens increased growth rate and there was a significant (P0.01) increase in super oxidedismutase and catalase levels in these broilers to combat the oxidative stress that was produced more during the rapid growth period.

Antibacterial Activity- For *Klesbiella*, *E. Coli*, *Proteus* and *Staphylococcus aureus*, Aqueous extract of *Ocimum Sanctum* demonstrated growth inhibition. Although alcoholic extract of *Ocimum Sanctum* demonstrated growth inhibition for *Vibrio cholera* [13]. *O. Sanctum* extracts have antibacterial effects against *E. coli*, *P. aeruginosa* and *S. aureus* [14, 15]. Previous research has shown that organic extracts of *Ocimum Sanctum L.* exhibit broad inhibition zones against *E coli*, *Staphylococcus aureus*, *Shigella sp.*, *Staphylococci sp.* and *Enterobacteria sp.* [16]. Kumari [17] investigated the impact of Tulsi leaf powder administered at 5g/kg feed on body weight increase in colibacillosis-infected broilers. It was discovered that body weight increase in *O. sanctum* leaf supplemented groups (both infected and non-infected) was substantially greater than in non *O. sanctum* leaf supplemented control groups.

Antifungal Activity- In medical research, fungal infections are notoriously difficult to crack. Pathogens that cause human and animal illnesses are found almost everywhere in the globe, and they pose a serious danger owing to medication resistance and disease recurrence. Candidiasis is a widespread illness that affects both humans and animals, and scientists have long struggled to understand it. In comparison to aqueous extracts [13], ethanolic extracts of *O. sanctum* (whole plant) were reported to have a 21-30mm zone of inhibition against *Candida albicans* [18].

Immunomodulatory Activity- Inflammation is one of the first indications of infection, and it is controlled by the activation of cellular mechanisms and the release of biomarkers. The assessment of the participation of extracts or active principles in the process of inflammation is based on changes in biomarker release or the activation or inhibition of cellular processes [19, 20]. Similarly to other activities, various extracts such as methanol extract and an aqueous solution of *O. sanctum* leaves have been utilized for immunomodulatory activities [21], aqueous and ethanolic extracts [22, 23], A similar finding was noticed by Mondal *et al.* [24], who found that an alcoholic extract of Tulsi regulates immunity and therefore improves the immune system's role.

Mode *et al.* [25] demonstrated that feeding of *O. sanctum* dry leaves @3g/Kg feed for two weeks from 5th to 6th week to immune suppressed broiler birds protected the birds from immune suppression and they also achieved the required target by significant increase in their body weight gain

Antihypertensive and Cardioprotective Activities: *Ocimum sanctum* has avoided both acute cerebral ischemia and long-term cerebral hypoperfusion (which causes cellular oedema, gliosis, and perivascular inflammatory infiltration) [26]. Long-term administration of *O. sanctum* protects Wistar rats from isoproterenol-induced cardiac necrosis via increasing endogenous antioxidant levels [27].

Antiviral Properties- Viruses are obligate intracellular parasites that rely on the machinery of their hosts to survive. As a result, any medication or drug delivery method used to manage or cure viral illnesses may interact with cells and cellular mechanisms, causing detrimental effects. As a result, harmless antiviral agents are required that do not interfere with the normal cellular process. These criteria have always aided workers in resolving issues, and different preparations have been made as

aqueous extracts of *Ocimum Sanctum* [28, 29, 30], ethanolic extracts of *Ocimum Sanctum* [28, 29, 31, 32], acetone extracts [33], and petroleum ether, benzene, diethyl ether, chloroform, ethyl acetate, methanol and ethanol extracts [29].

Analgesic Activity-

In experimental pain models (tail flick, tail clip, and tail immersion techniques), the *O. sanctum* oil was found to have no analgesic effect. It was, nevertheless, beneficial in a dose-dependent way against the acetic acid-induced writhing technique in mice. It was, nevertheless, beneficial in a dose-dependent way against the acetic acid-induced writhing technique in mice. The oil's writhing suppressing action is thought to be peripherally mediated through the inhibitory effects of prostaglandins, histamine, and acetylcholine [34]

Effect on Growth- The leaves of *O. sanctum* can be offered as a dry powder combined with feed or as an extract mixed with water. Hasan *et al.* [35] found that supplementing *O. sanctum* leaf extract in water increased the body weight of Cobb broilers by 16.97% as compared to the control group. Biswas *et al.* [36] discovered that broilers given *O. sanctum* leaves extract at 1ml/liter in drinking water had considerably greater body weight than the control group. Alom *et al.* [37] observed that supplementing broiler drinking water with Tulsi leaves extract @2ml/liter leads in considerably increased live body weight. Similarly, investigations have indicated that feeding *O. sanctum* leaves dry powder resulted in a substantial rise in broiler body weight. According to Singh *et al.* [38], giving *O. sanctum* leaf powder to broiler chicks at a 1% level in feed results in a substantial increase in muscle weight of the breast, thigh, and legs, resulting in a greater body weight compared to control chicks. The antioxidant capabilities of Tulsi components may explain the rise in body weight of chicken fed *O. sanctum*. When oxidative stress is minimized, normal body development occurs, resulting in increased body weight.

The antioxidant capabilities of Tulsi components may explain the rise in body weight of chicken fed *O. sanctum*. When oxidative stress is minimized, normal body development occurs, resulting in increased body weight. According to Kelm *et al.* [26], *O. sanctum* contains a variety of chemicals (carnosol, ursolic acid, rosmarinic acid, apigenin, eugenol, cirsilinoleol, and cirsimaritin), all of which have significant redox/anti-oxidant effects as well as anti-inflammatory action. Many herbs and botanicals, according to some studies, can boost development rate by increasing feed intake [39]. Others, however, have studied the subject and found no convincing evidence that herbs and spices increase farm animal palatability [40].

Other Effects

Tulsi leaf product addition in broiler diets resulted in insignificant increases in liver, bursa, and spleen weights [41]. Tulsi leaf powder supplementation of broiler meals had no effect on cholesterol content [42], but Deshpande [43] observed a substantial rise in blood HDL, cholesterol in laying hens. Feeding broilers a diet enriched with Tulsi leaf powder significantly decreased the levels of liver enzymes (ALT & ALP) [44]. Tulsi leaf powder supplementation in feeds containing aflatoxins significantly reduced AST, ALT, and ALP enzyme activities [45]. Varaprasad Reddy [46] found a substantial decrease in lipid peroxidation levels and an increase in GSH levels in plasma in broilers given tulsi leaf powder (0.5 percent) and Selenium (0.3 ppm). Tirupathi Reddy *et al.* [46] found a 4 percent reduction in feed cost per unit live weight increase in broilers fed a mixture of amla, tulsi, and turmeric at 0.25 percent. Tulsi leaf powder supplementation reduced feed consumption in broilers, according to the results [47].

CONCLUSIONS

The rising demand on the livestock sector to minimize or eliminate the use of feed antibiotics as growth promoters has prompted fresh research into safe and efficient alternatives. For the alternate of antibiotics, among the different herbs tulsi is promising one, which was proved by different researchers. Different studies clearly indicate that feeding of Tulsi leaf in broiler chickens provides Antioxidant activity, Antibacterial activity, Antifungal activity, Immunomodulatory activity, Antihypertensive and cardioprotective activities, Antiviral properties, Analgesic activity & accelerates growth response of the birds etc. Because scientific discoveries on active components, mechanisms of action alone or in combination, and use of tulsi are still insufficient, it is important to strengthen phytochemical, physiological, and phytopharmacological research in areas that have been understudied or are less well recognised.

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