Review Paper

The influential medicinal plants in the livestock and poultry industry in the Iranian market: A review

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Abstract:
Medicinal plants are highly popular due to their many useful uses in the health of animals, poultry, and humans. Today, the addition of feed additives and feed supplements including prebiotics, plant extracts, and probiotics in the diet of farm animals is increasing because of their useful applications, including increasing yield and production, as well as maintaining the health of livestock and poultry. The purpose of using growth-promoting antibiotic substitutes in livestock and poultry feed is to change the microbial flora in the host's digestive system to improve animal health and growth. These compounds, while increasing the digestibility of nutrients, reduce the growth of pathogens through competitive elimination mechanisms and stimulation of immune-related organs. Plant extracts with high amounts of phenolic and flavonoid compounds have stronger antioxidant activity. Based on this, the approach of the World Health Organization to the discussion of ethnopharmacology, the identification, and investigation of the medicinal effects of those plants, has been increased in the field of traditional medicine to produce low-risk drugs and natural antioxidants.

Keywords: Medical plant, Application, Animal husbandry.

1. Introduction

The importance of animal husbandry for economic, cultural, and social reasons, such as the source of income for different strata of society, increasing soil fertility, and production of livestock products (milk, meat, wool, *etc*.) is very important for rural and nomadic households. This industry has always been the focus of this part of society, and in a way, animal husbandry is considered the main capital of families in these areas, who can earn relatively good income through this activity [1, 2]. Today, the animal husbandry industry is facing major challenges, including environmental effects such as the production of greenhouse gases, inappropriate productivity rates, and price fluctuations, both in the discussion of livestock inputs and expenses, and in the sale of manufactured products [3].

Animal husbandry plays an important role in supplying the food needed by humans, in this case, we can mention the production of dairy products, meat, wool, and leather. In addition, animal manure plays an essential role in the agricultural industry and promotes production in this field [4].

The Food and Agriculture Organization of the United Nations (FAO) has announced that the demand for food is increasing in all countries of the world, which should be solved through the use of better genetics and more appropriate and targeted nutrition. Of course, according to the predictions made by the researchers of this international institute, the per capita consumption of food groups will have a constant trend until 2028, but in the long term, the price of agricultural products and red meat will increase. This demand growth is more tangible, especially in countries that witness high population growth [5, 6].

The health and quality of livestock products mainly affect human health and the quality of human life. Therefore, raising livestock and poultry in optimal conditions can lead to the production of healthy and quality livestock products and guarantee the health of the society that consumes livestock and poultry products [7].

Despite all the positive effects of using antibiotics, recent research shows that antibiotic residues in poultry carcasses lead to the creation of resistant strains in the human body and prevent the treatment of many diseases that can be treated with antibiotics. Therefore, plant extracts, probiotics, enzymes, etc. are considered alternatives in livestock and poultry diets [8, 9]. Medicinal plants have special value and importance in providing health and wellness to communities both in terms of treatment and prevention of diseases. This part of natural resources is as old as humans and has been one of the most important sources of human food and medicine supply for generations [10]. Medicinal plants with antimicrobial effects as well as reducing serum lipids have been proposed as suitable alternatives for antibiotics.

Traditional veterinary medicine is one of the legitimate and scientific traditional methods of veterinary medicine, which has been respected among different ethnic groups for a long time. Today, the science of using medicinal plants and applying traditional methods to maintain the health, hygiene and treatment of sick animals is called traditional veterinary medicine or ethnoveterinary. In general,

traditional veterinary medicine includes the skills, experiences, methods, cultures and native beliefs of different ethnic groups, which are aimed at maintaining health and treating animal diseases and relying on herbal substances and medicines [11-13].

Medicinal plants have special value and importance in providing health and wellness to communities both in terms of treatment and prevention of diseases [14]. This part of natural resources is as old as humans and has been one of the most important sources of human food and medicine supply for generations.

In this article, an attempt is made to introduce some of the most effective and common medicinal plants used in animal and poultry nutrition.

2. Thyme (*Thymus vulgaris*)

Thyme is a native plant of the eastern Mediterranean and one of the oldest medicinal plants that have been used in human and animal medicine for the treatment of many diseases since ancient times. In poultry nutrition, due to the adverse effects of using antibiotics as growth promoters, researchers are looking for suitable sources to replace them. One of the alternatives that can be investigated in this field is medicinal plants. In recent years, the use of these sources has been increasingly considered in the diet of broilers, laying hens, and quails. It has been shown in various reports that medicinal plants (whole plants, leaves, or flowers) are effective in improving poultry performance to a great extent. Thyme is one of the medicinal plants that can be considered an effective alternative to antibiotics in poultry diets. In this study, the effects of thyme on different parameters of production performance in poultry are investigated. [15].

Thyme is a perennial plant belonging to the Lamiaceae family. The use of green parts of thyme as a seasoning and medicinal plant is common all over the world. Thymol (5-methyl 1-1-2-isopropyl phenol) and carvacrol (5-isopropyl 1-2-isopropyl phenol) are the main components of this plant, which have antimicrobial, antioxidant properties, treatment of respiratory diseases, treatment of wounds, antiflatulence, and spasm [16, 17]. Stomach and have anti-worm and anti-fungal properties [18]. The beneficial effects of thyme are well known and its consumption is recommended not only to improve the physiological processes of the body but also to relieve diseases and chronic pain [19]. In recent years, thyme is used as a natural additive and a useful medicinal plant in poultry diets. Unlike synthetic antibiotics, thyme can be used as a natural growth stimulant without harmful effects in poultry feed.

Considering the antimicrobial activity of thyme, it is expected that this plant will have positive effects on the growth of broiler chickens. The beneficial effects of thyme on the performance of broiler chickens alone or in combination with other herbs have been reported. Mansoub and Nezhady (2011) observed that the use of 1g/kg of thyme in the diet of broiler chickens improves the process of increasing body weight and feed efficiency [20]. Zhang et al. (2021) stated that thyme oil can be the best alternative to antibiotic growth promoters. Also, in a study, the use of thyme oil at 100 and 200 ppm in the diet increased feed intake, and body weight, and improved the feed conversion ratio (FCR), as well as the percentage of liver, heart, and kidney weight, and decreased the percentage of abdominal fat [21].

Researchers reported that the addition of thyme in the diet of laying hens improved conversion rate, egg production, fertility, and hatchability, but there was no change in yolk characteristics (weight, height, diameter, and color), shell (weight and thickness) as well as (Length, width and shape index) did not produce eggs, albumin (weight and height) and Howe units [22, 23].

The utilization of these common cancer prevention agents in creature nourishment diminishes oxidation by supplanting its viable compounds within the phospholipid film of the cell [24]. The use of thyme plant within the count calories not as it were through the nearness of antimicrobial compounds due to the nearness of the phenolic bunch in thymol and carvacrol but too by making a difference to diminish the pH of meat to less than 5.8, decreases the microbial stack of meat amid collect after the butcher [25]. The phenol shown in thyme decreases the oxidation of hemoglobin and the generation of methemoglobin amid the post-slaughter period, in this way keeping up the quality of meat color. Lessening of oxidation file (TBARS) taken after the utilization of thyme shows the hindrance of fat oxidation due to the nearness of phenolic gather and hydroxyl gather that repress free radicals, as well as the chelation of metal components by the carboxyl bunch of this plant's compounds [26]. In expansion, the utilization of thyme moves forward the taste and scent of devoured meat. In common, the inquire about comes about appears that the utilization of thyme plant in animals nourish or the utilize of its extricate can viably keep up color quality, decrease microbial stack, decrease fat oxidation, and increment the taste and toughness of meat amid the capacity period after being murdered

3. Savory (*Satureia hortensis* L.)

It is an annual plant that is native to temperate regions. The growth of this plant is low and has a bushy form. The height of the plant reaches 30 to 60 cm [27]. Examining the chemical composition of Savory essential oil showed that this plant contains significant amounts of two phenolic ketones named carvacrol and thymol [28]. The amount of carvacrol is the main indicator of antimicrobial activity in *Satureia hortensis* L., and it is expected that species with high thymol and carvacrol will show strong antimicrobial activity [29].

Some researchers observed a significant improvement in body weight, weight gain rate, food conversion ratio and reduction in losses due to the addition of salt, its derivatives or some of its effective compounds on the growth performance of broiler chickens [30, 31]. While other researchers did not report a significant effect [32, 33].

In a study, the effect of savory plant essential oil on the concentration of volatile fatty acids in cow's rumen was investigated. The result of this study showed that the concentration of volatile fatty acids and acetate in the rumen fluid was higher in the experimental group fed with 2500 grams of sweet essential oil daily than in the control group. [34].

4. Liquorice (*Glycyrrhiza glabra*)

Licorice plant (*Glycyrrhiza glabra*) belongs to the Leguminaceae family and is one of the most important medicinal plants that has been used to treat many diseases since 4000 years ago [35]. Some of the effective ingredients of this

plant include saponin, triterpenes, flavonoids and isoflavones [36]. The most important substance in the licorice plant is glycyrrhizic acid, the amount of which is higher in the licorice root than in other parts of the plant [37]. Licorice plant extract has antibacterial properties. Therefore, it is suggested that this compound can be used as an antibacterial drug in the treatment of diseases [38].

Researchers' trials on mice revealed that there was no change in the amount of food consumed when different amounts of licorice were used compared to the control treatment. Gharib Naseri et al. (2007) reported that the aqueous-alcoholic extract of licorice leaves reduces ileal contractions in rats and stated that this extract probably reduces ileal contractions without the involvement of beta-adrenergic, opioid, and nitric oxide receptors and concluded that the major part. This inhibitory effect is applied with the involvement of calcium channels, and a small part of the anti-contractile action of this extract may be the result of the activation of ATP-dependent potassium channels [39]. This anti-contractile effect is the result of the action of flavonoids in licorice extract. Therefore, it seems that licorice extract has decreased the feed intake and increased the digestibility and absorption of calcium in laying hens. While the examination of the results of other experiments on mice showed that no change in the amount of food consumed when using different amounts of licorice compared to the control group was observed [40, 41].

In laboratory conditions, ethanolic and stannic extracts of licorice root increased total gas production, degradability of organic matter and metabolizable energy, and decreased production of carbon dioxide and methane gases in goat rumen fluid [42].

5. Germanders (*Teucrium polium*)

Germanders (*Teucrium polium*) belongs to the Lamiaceae family and is native to the Mediterranean, North Africa, and Southwest Asia. This plant mostly grows in the plains, grasslands, and mountain slopes, and it has been identified in most regions of Iran, including different regions of the north, west, south, and center of the country [43]. In traditional medicine, this plant is antipyretic, appetite suppressant, anticonvulsant, energizing, anti-inflammatory, and pain reliever [44]. Since ancient times, the plant has been used to reduce blood sugar, reduce blood fat, solve digestive problems, treat diarrhea and heartache, reduce blood pressure, and remove urinary tract infections [43, 44]. Germanders have anti-inflammatory, antioxidant, antipyretic, analgesic, and antimicrobial effects. This plant contains amounts of tannin, linalool, terpenoid, saponin, sterol, flavonoid, and leukoanthocyanin [45].

The use of germanders leaf essential oil at low levels improves feed consumption [46, 47]. In general, essential oils such as linalool, carvacrol, and thymol in the mint family are appetizing and stimulate the digestive process. Therefore, it has a positive effect on feed consumption and animal performance.

6. *Eryngium billardieri* F. Delaroche

It is a genus of flowering plants from the Apiarene family, which includes about two hundred and fifty species. This plant can grow naturally or in garden environments and many therapeutic effects have been mentioned for it [48]. Among the therapeutic effects of this plant, we can mention the treatment of diabetes by activating pancreatic cells and stimulating the production of insulin from these cells. The compounds that have been observed a lot in the species of this genus include sesquiterpenes such as α-(-)-Bisabolol, α-Muurolene, and Germacrene D and non-terpene oxygenated compounds such as Trimethylbenzaldehyde and trans-2-dodecenal [49, 50].

Epidemiological and biochemical studies have shown that common diabetes treatments do not reduce the risk of developing these complications due to their inability to reduce the level of oxidative stress. Therefore, the use of compounds obtained from plants that have high antioxidant properties and can reduce the level of oxidative stress factors, and have fewer side effects on the body are considered. The most characteristic feature of all flavonoids is their antioxidant properties. This feature is of particular importance. Because body cells are constantly exposed to damage by free radicals and reactive oxygen species that are produced during normal oxygen metabolism or external damage. [50-51].

Antioxidant compounds in plants reduce the absorption of glucose from the intestine or reduce blood sugar by inhibiting the transfer of glucose from the small intestine and delaying the emptying of the stomach contents into the small intestine. On the other hand, due to the presence of phenolic and flavonoid compounds, the leaves and flowering branches of the *Eryngium billardieri* have antioxidant, antimicrobial, anti-inflammatory, and appetizing properties [52, 53].

7. Asafoetida (*Ferula assa-foetida*)

Asafoetida is one of the medicinal plants that, in addition to its healing properties, is also used to flavor foods. It has a pungent smell and a bitter taste. This plant grows in the dry and calcareous areas of hot Asian regions such as the deserts of Iran and the mountains of Afghanistan and India and has yellow flowers that are placed in the form of umbrella inflorescences at the end of the stems. The fruit of this plant is oval and brown [54]. Asafoetida has oleoresin gum or sap obtained from the root or lower stem of the plant. The gum of this plant has a strong sulfur smell, similar to the smell of stinky garlic [55].

Almost all Asafoetida gum contains di, tri, tetra sulfide compounds, cocaine derivatives, camulonephril, episamarkandin, amblyprenin, and kafferol [56].

In an experiment, Shadmani et al. (2014) reported that the use of different levels of Asafoetida powder significantly increased the body weight of broiler chickens compared to the control treatment [57]. Improving the performance of broiler chickens can be caused by stimulating the secretion of digestive substances and the antibacterial effect of medicinal plants [58].

8. Lavender (*Lavandula stoechas*)

Lavender is a perennial plant in the form of a small bush half a meter long. Lavender flowers have small clusters of blue or garlic red to purple flowers. The used part of this plant is its leafy and flowery branches, in addition to medicinal uses, lavender essential oil is also used [59]. Some of the properties of this plant include tonic effects in relieving asthma, treating old wounds, treating nausea, healthy skin and hair, strengthening the stomach, cleansing the liver, *etc* [60]. It is traditionally believed that lavender oil has

antibacterial, antifungal, anti-flatulent, smooth muscle relaxant, sedative, and anti-depressant properties and is effective in treating burns and insect bites.

In a research aimed at the effect of lavender essential oil on the performance and carcass characteristics of broiler chickens raised under heat stress, it was found that this plant is effective in modulating the negative effects of stress on the performance of broiler chickens. On the other hand, chickens fed with lavender essential oil consumed more feed than the control group, and the highest weight gain was related to the group that was fed with a diet containing 350 PPM of lavender essential oil [61].

In an experiment with lavender essential oil, no significant difference was observed for feed intake (FI), feed conversion ratio (FCR), and mortality among treatments. But the relative weight of the liver was significantly reduced compared to the control group (CNT). Birds fed diets supplemented with 24 and 48 mg/kg of lavender had lighter breast meat and higher concentrations of superoxide dismutase (SOD). Based on the results of this research, lavender can be used as a growth stimulant in broiler nutrition with potential improvement in breast meat quality [62].

Conflicts of interest

The author declares that there is no conflict of interest. The authors alone are responsible for the accuracy and integrity of the paper's content.

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