



St John's Wort (*Hypericum perforatum* L.) in Broiler Nutrition

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ABSTRACT

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Nowadays, the concept of sustainability is important in poultry meat production as in every field. The health status of the birds must be well-stated for sustainable broiler production. Considering that synthetics attract reactions and some of them are banned or limited, the use of natural feed additives for health protection has been the focus of research attention. St John's wort is a plant that can positively affect the health of animals with bioactive components such as the hypericin it contains. St John's wort or hypericum (*Hypericum perforatum* L.) has antiviral and antimicrobial effects in broilers and positively affects on blood biochemical parameters. This positive effect on health level also improves performance. The review aims to give information about St John's wort and to examine a limited number of studies on their use in the diet of broilers.

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Introduction

Broiler production aims to obtain high quality and amount of animal protein within the optimum feed conversion ratio. Therefore, quite different feed additives are used and some of those are antibiotics which started to be used in poultry nutrition in the 1940's. However, due to the development of antibiotic-resistant bacterias in the animal-food-human cycle and residues in meat, their use as growth promoter feed additive is prohibited in the European Region (Castanon, 2007). Nowadays, animal health protection is very important for sustainable production.

Accordingly, the focus has been on the possibilities of using natural source feed additives such as probiotics, prebiotics, organic acids and herbal stuffs in poultry nutrition. Herbal origin feed additives are added in their extract or directly to the feed and they have various bioactive components which affect broilers' health or performance parameters. These quite diverse effects; increasing feed consumption, flavoring, stimulating digestive enzyme secretion, antimicrobial, antioxidative

activity, coccidiostat activity, antiviral and immune supporting and anti-inflammatory effects (Kırkpınar et al., 2011).

Hypericum perforatum L. is a species 0.3-1.2 m high perennial plant with the names of St John's wort, hypericum, millenpertuis ("sarı kantaron" in Turkish), in the family *Hypericeae* (*Clusiaceae*) (Southwell et al., 2001). It is native to Europe, West Asia, North Africa, Maderia and the Azores and has weed status in North America and Australia; besides it spreads by oellet or seeds and can be found at pastures, disturbed sites or side of the highways (Saddiqe et al., 2010). This plant grows naturally in Türkiye between the altitudes 750-3200 m; has been used for a long time in folk medicine (Cakir et al., 1997). It is believed that the name "hypericum" derived from the Greek words "hyper" (over) and "eikon" (image), St John's wort may have arisen as the flowers bloom around St John's Day, 24th of June (Barnes et al., 2001). This review aims to that give information about hypericum and indicate its effects on broiler nutrition.

The Use of Hypericum in Broiler Nutrition

Hypericum has variable bioactive components such as flavonoids, hyperforin, pseudohypericin, hyperprofin and hypericin (Landy et al., 2012; Davoodi et al., 2014). Hypericin and pseudohypericin are major bioactive components of hypericum called photodynamic pigments that have many positive effects (Gadzovska et al., 2005). These components have many effects (antiviral, antibacterial and antidepressant) on human and animal health. The main active compositions of hypericum extract are hyperoside, quercitrin, quercetin, pseudohypericin, and hypericin, and a combination of these compounds could mediate the antiviral activities in high-performance liquid chromatography/electrospray ionization–mass spectroscopy (Chen et al. 2019). Hypericum is known for its use in the treatment of mild-to moderately severe degenerative disorders (Barnes et al., 2001). Nonetheless, hypericum has valuable lipid content. The fatty acid composition of hypericum is shown in Table 1 (Bakır, 2018).

Table 1. The fatty acid composition of Hypericum (Bakır, 2018).

Fatty Acids	g/100g
Myristic acid	0.07
Palmitic acid	8.86
Margaric acid	0.04
Stearic acid	4.76
Cyclopropanoic acid	0.04
Arachidic acid	0.47
Tricosanoic acid	0.24
<i>Total Saturated Fatty Acids</i>	14.48
Palmitoleic acid	0.1
Linolelaidoyl chloride	0.1
Oleic acid	-
Petroselinic acid methyl ester	34.23
Gadoleic acid	0.38
Erucic acid methyl ester	0.11
<i>Total Mono Unsaturated Fatty Acids</i>	34.92
Hexadecadienoic acid methyl ester	-
Linoleic acid	44.35
11,14-Eicosadienoic acid methyl ester	1.07
<i>Total Poly Unsaturated Fatty Acids</i>	45.42
Conjugated Linoleic acid	5.08
<i>Total Trans Fatty Acids</i>	5.08

Although quite limited, there is some research on the use of hypericum in broiler nutrition. A study has shown that dry extract of hypericum supplementation in broiler feeds induces feed conversion ratio improvement and reduces mortality rate, also increasing New Castle antibody titer in broilers (Feizi and Nazari, 2011). These results were confirmed by measurements taken on days 10, 25, 34 and 42. Besides, Chen et al. (2019) demonstrated that hypericum extract had significant anti-IBV effects in vitro and in vivo, respectively.

In their study Landy et al. (2012), examined the effects of the adding dried hypericum (5 and 10 g/kg) in diets on broilers and compared it with the impact of antibiotics. They found the highest avian influenza antibody titers in 10g/kg hypericum group at day 42. Serum protein, albumin, triglyceride and low-density lipoprotein levels

were not affected. However, hypericum significantly decreased total cholesterol (5 g/kg) and high density lipoprotein levels (10 g/kg). In addition, carcass traits were not significantly influenced by dietary treatments except for percentage of liver and heart that increased antibiotic and control group. According to these results, hypericum improved immunity and has beneficial effects on lipid metabolism.

Some researchers state that adding alcoholic extracts of hypericum in drinking water (2 ml/l) of broiler has some positive effect on physiological response to stress and welfare (Skomorucha and Sosnowka-Czajka, 2013). It has contributed to a decrease in cholesterol levels and an increase in the level of the immunoglobulins in the blood. Furthermore, hypericum extract increased body weight and reduced mortality.

Davoodi et al. (2014) investigated that the effect of adding hypericum to drinking water in comparison to virginiamycin on performance and welfare of broilers. They found that feed intake and final body weight have increased with all hypericum doses (150, 200 and 250 ml/l) and virginiamycin. Liver, heart and gizzard percentages were significantly lower in all treatment groups. Triglyceride, cholesterol and low density lipoprotein level decreased and high density lipoprotein levels increased significantly in all hypericum and virginiamycin groups. It has been determined that adding hypericum (all levels) and virginiamycin in the water increases New Castle antibodies, also data showed that *E. coli* population reduce and *Lactobacillus* population increased significantly in all treatments groups. This research data shows that hypericum has important positive effect on broiler health.

In a study, Stress-Bio-Max (SBM) mixture (betaine, vitamin C, lavender, *Melissa officinalis* and hypericum) that the main component is hypericum was used against heat stress on broilers (Behboodi et al. 2021). This mixture has been added to drinking water at certain levels (0, 0.25, 0.50 and 1 ml/l). The effects of the mixture against heat stress are quite visible in this study. Especially at 0.25 and 0.50 ml/l levels, it has been observed that live weight gain is increased. Nonetheless, corticosterone levels were found lower in these groups on the day 32 and 42, compared to the control group. Glutathione peroxidase and superoxide dismutase activities were decreased, and total antioxidant capacities were increased in all treatment groups. Malondialdehyde, aspartate transaminase and alanine aminotransferase levels also were decreased to 0.25 and 0.50 ml/L. Researchers have stated that SBM can alleviate the negative effects of temperature stress in broilers.

Conclusion

It is important to protect animal health for a sustainable poultry meat production. Hypericum has been used in traditional medicine, but it has also attracted attention in modern medicine due to the bioactive substances it contains. This plant, which grows in Türkiye and in many regions of the world, has been used as a natural health protection agent. It is given to broilers in different forms and levels within feed or water. A limited number of studies show that hypericum strengthens immunity against viral diseases such as New Castle and Avian Influenza. It has a repressive effect against pathogenic microorganisms

in the intestine, while supporting beneficial bacteria. It can positively affect blood biochemical parameters especially lipid profile. Due to all these effects, it has also shown improvement in performance parameters.

In conclusion, it is thought that hypericum may be a health-protective, performance-improving natural feed additive in the diets of broilers. According a few studies show that St John's wort can be given to broilers in different forms, mixtures and methods. 50 ml/l or a different form can be added up to 250 ml/l as an alcohol extract in water. The addition of 10 g/kg to the feed provided positive improvements. In addition, more comprehensive studies are needed to determine the way it is given (feed or drinking water), the form (as extract, dried or only active ingredients) and levels.

Declarations

Author Contribution Statement

Please indicate how each author contributed to this work and at what stage. For example:

Özgün Işık: Investigation, supervision, writing, editing.

Helin Atan: Investigation, writing.

Figen Kırkpınar: Investigation, supervision.

Ayşe Betül Avcı: Investigation, writing.

Conflict of Interest

The authors declare no conflict of interest.

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