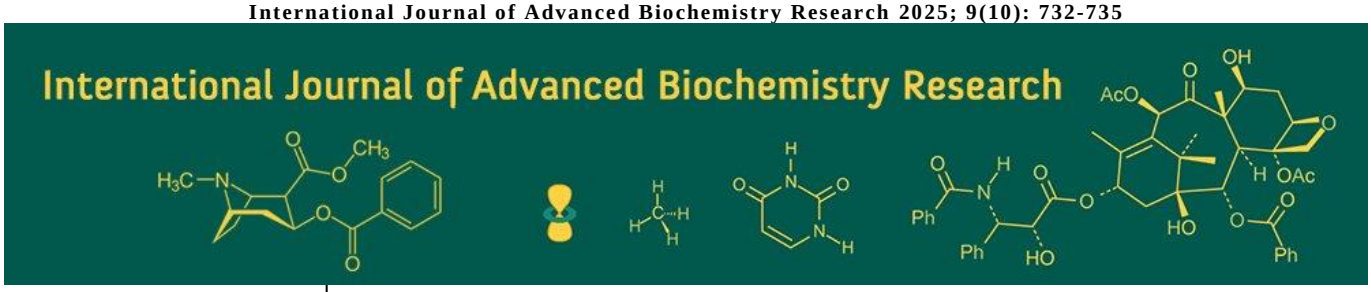

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Effect of cumin (*Cuminum cyminum*) seed powder supplementation on the blood profile in broiler chicks

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Abstract
The aim of this experiment was to investigate how supplementing broiler chickens with cumin (*Cuminum cyminum*) seed powder affected their blood lipid profile. The study used a completely randomized design in which 192 straight run day-old commercial broiler chicks were divided among four treatments, each consisting of 12 birds. The control group is treatment group T_1, as no cumin seed powder was added. Cumin powder was mixed in additions of 0.5, 1.0, and 1.5 percent for treatment T_2, T_3 and T_4 groups, respectively. In broiler chickens, dietary supplementation with 1.5 percent cumin seed powder (T_4) significantly decreased the concentrations of triglycerides, cholesterol, and very low density lipoprotein in the serum. However, high density lipoprotein (HDL) is better under the 0.5 % cumin treated group.

Keywords: Broiler chicks, cumin seed powder, blood lipid profile

Introduction
Poultry, a vital global industry, plays a significant role in food security and international markets, producing broilers and laying hens, making it a vital sector in the global economy. The poultry sector, crucial for food safety and nutrition, is the fastest-growing agricultural sub-sector, particularly in developing nations, demonstrating significant growth potential. The market value of the poultry industry, which was $310 billion in 2020, is projected to reach $322.55 billion in 2021, with a compound annual growth rate (CAGR) of 3.8%. The market is anticipated to grow at a CAGR of 7% to reach $422.97 billion in 2025 (Global Poultry Industry and Trends).

The total number of poultry in India is around 851.81 million, representing a 16.81% rise from the 729.21 million recorded in the previous census. The output of meat and eggs is growing at a rate of 7.52% and 8.51% each year, respectively. Due to its rapid expansion, India is now the third-largest producer of eggs (3.3 billion), after the United States and China, and the fifth-largest producer of meat (4.1 million tons of broiler meat) (BAHS, 2020) [2].

Chicken and poultry meats are essential for human health and physiological functioning, providing macronutrients and micronutrients that the body cannot produce or cannot obtain in sufficient quantities. These high-quality complete protein sources, including plant-based soy protein, provide a full complement of all 20 amino acids and adequate quantities of the nine essential amino acids. Carbohydrates are not naturally present in chicken or other poultry products, and their nutritional and energetic profiles differ (Marangoni *et al.,* 2015) [11].

A key component of contemporary broiler chicken farming is the use of antibiotics as growth enhancers (Sharifi *et al.,* 2013) [19]. By having antibacterial properties, antibiotic growth promoters (AGPs) strengthen lumen epithelium, lower bacterial load, and minimize bacterial nutrient consumption. Because of this, there is a deliberate search for antibiotic substitutes, and several choices have been studied globally (Mehrabi *et al.,* 2012; Berrama *et al.,* 2017) [13, 3]. Antibiotics as feed additives in animal nutrition had been banned in Sweden in 1986, and other nations followed suit. The European Union likewise banned them in 2006 (Srivastava *et al.,* 2016) [20].

This has led to an increased search for alternative feed supplements and a challenge for poultry researchers to come up with a substitute for antibiotic growth promoters (AGP)

(Ibrahim *et al.*, 2005) [8]. Alternative growth boosters that are currently in use include products and herbs (Ocak *et al.*, 2008) [16].

In traditional medicine, they are also frequently used to treat a wide range of illnesses, such as cancer, diabetes, acute gastritis, chronic diarrhea, and dyspepsia. Cumin's bioactive components, including flavonoids, phenols, and terpenes, have typically been credited with its biological and medicinal qualities. Additionally, it is utilized to treat puerperal diseases, edema, fever, nausea, vomiting, and stomach pain (Mnif and Aifa, 2015) [15]. Astringent, stomachic, carminative, stimulant, and helpful for diarrhea and dyspepsia are some of the medical uses for cumin (Malhotra & Vashishtha 2008) [10].

The main volatile components of cumin include terpenoids, cymene, and cuminaldehyde (Bettaieb *et al.*, 2011) [4]. The primary components of their fragrance molecules are cuminic alcohol and cumin aldehyde. The substituted pyrazines, 2-ethoxy-3-isopropylpyrazine, 2-methoxy-3-sec butylpyrazine, and 2-methoxy-3-methyl pyrazine are additional significant fragrance components of toasted cumin. γ terpinene, safranal, p-cymene, and β-pinene are other constituents (Li and Jiang, 2004) [9].

Materials & Methods

One hundred twenty-two (192) straight-run, one-day-old commercial broiler chicks (Vencobb 400) were used in the investigation. They were split into four treatment groups of forty-eight chicks each, which were then split into four replicates of twelve chicks each. Commercially available cumin seed powder was purchased from the market, and the measured amount of cumin powder was mixed to create various treatment rations (prestarter, starter, and finisher rations). T_1 (control, or standard diet according to BIS, 2007), T_2 (standard diet + 0.5% cumin seed powder), T_3 (standard diet + 1.0% cumin seed powder), and T_4 (standard diet + 1.5% cumin seed powder) were the four dietary treatments. During the winter, treatment rations were began on the first day and continued until the thirty-fifth day. All of the birds were given broiler pre-starter feed from the first day to the seventh day of their lives. Broiler pre-starter mash was given in the first week of life, followed by starter mash in the second and third weeks, and finisher ration in the fourth and fifth weeks. Every bird has constant access to clean, fresh, and wholesome drinking water.

Blood lipid parameters

The blood samples were assessed for biochemical parameters with the help of Department of Veterinary Pathology, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Sardarkrushinagar.

Collection of blood samples and analysis: Eight (08) birds from each treatment (2 birds per replicate) group were randomly selected at the end of the fifth week (35th days) of life to assess the blood lipid profile. 2 ml blood was collected per bird from bird's jugular vein into serum activator vial and centrifuged at 2500 rpm for 5 mins for serum separation. Serum 40 activator vials without anticoagulant were utilized to collect the blood samples from experimental birds used to assess the carcass traits.

Analysis of blood biochemical parameters

Without using an anticoagulant, the serum was extracted from the blood. By using a semi-automated biochemical analyzer, the samples were tested for triglycerides, cholesterol, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) concentration using haematological analyzer machine.

Results and Discussion

The effects of cumin seed powder on blood lipid profile of broiler chicks at 35 days are shown in Table 1. The serum biochemical profile offers important knowledge about an animal's health and immunological condition. Triglyceride, cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL) and very low density lipoprotein (VLDL) parameters are important parameter that reflects the health status of birds/animals and also their status indirectly reflects the health status of human beings consuming their products.

1. Tryglycerides

Triglycerides are a type of fat (lipid) found in blood. Triglycerides are not utilized by the body, therefore, stored in fat cells. Later hormones release triglycerides for energy between meats or as per requirements and condition. The means and S.E. of the bird for the total triglyceride at the end of experiment fed with T_1, T_2, T_3 and T_4 ration groups have found to be 121.35±2.16, 123.11±2.15, 124.30±2.72 and 107.75±4.10, respectively. Lower level of triglyceride (mg/dL) is observed in 1.5 percent cumin supplemented group (T_4) followed by T_3, T_2 and T_1 group. Analysis of variance revealed that T_4 group differs significantly (p<0.05) with all treatment groups i.e. T_3, T_2 and T_1 group, whereas, T_3, T_2 and T_1 group did not significantly difference among each other. However, there is no definite trend of effect of feeding cumin in diet showed lower level, whereas, 1.0 percent cumin feeding showed the highest value than control group. Feeding of 1.5 percent (T_4) cumin ration group (107.75±4.10 mg/dL) obtained better level of triglyceride as compared to other ration groups. The reduced level of triglyceride induced by cumin may be associated with the unsaturated fatty acids composition of spice (Shahnaz *et al.*, 2004) [18]

2. Cholesterol

Cholesterol is a waxy, fat-like substance that's found in all the cells in body and precursor of bile acid biosynthesis and steroid hormones. Cholesterol play an important role since it is a main sterol in the body, cell surface component, and intracellular membrane. Blood or serum cholesterol is much affected by genetic factor, feed, and medicines. High levels of cholesterol can increase your risk of heart disease (Regar *et al.*, 2019) [17]. For T_1, T_2, T_3 and T_4 treatment groups, the mean and S.E. of total cholesterol (mg/dL) at the end of experiment has noted 223.39±3.23, 221.78±8.23, 223.93±4.20 and 200.75±3.13, respectively. Analysis of variance for cholesterol has found significant (p<0.05) under different treatment groups. Significantly (p<0.05) lower cholesterol level has attained in T_4 supplementation group (200.75±3.13) followed by T_2, T_1 and T_3 supplementation group. The lower blood cholesterol level has observed in the 1.5 percent (T_4) cumin supplemented group (200.75±3.13 mg/dL) than other treatment groups. Low level of cholesterol in cumin supplementation group might be due to the active compound that are found in cumin which act as inhibitors to the active enzyme hepatic 3 hydroxy-3

metyhyglutaryl coenzyme A (HMG-CoA) that synthesized the cholesterol (Crowell, 1999) [5]. Furthermore, this reduction in blood cholesterol could be contributed in some 80 cases to the reduction in some hormones secreted by the cortex of the adrenal glands, which in turn causes the reduction in the secretion of fatty acids from the adipose tissue which leads to the reduction of the level of fatty acids including blood cholesterol (Ganong, 2005) [3].

Table 1: Means and S.E. of different dietary treatments on blood lipid parameters in broilers chicks

Parameter	T_1	T_2	T_3	T_4	P value
Triglyceride	121.35^{b}±2.16	123.11^{b}±2.15	124.30^{b}±2.72	107.75^{a}±4.10	0.001
Cholesterol	$223.39^{b\pm}$3.23	221.78^{b}±8.23	223.93^{b}±4.20	200.75^{a}±3.13	0.009
HDL	100.07±1.55	113.43±22.73	99.53±1.51	98.05±4.34	0.769
LDL	65.82±1.82	67.92±2.97	66.56±2.69	65.40±0.75	0.863
VLDL	24.27^{b}±0.43	24.62^{b}±0.43	24.86^{b}±0.54	21.55^{a}±0.82	0.001

Mean becoming with different superscript within a row differ significantly (p<0.05)

3. High Density Lipoprotein (HDL)

HDL often named as good cholesterol due to it is a lipoprotein that transports lipid from peripher to liver. Cholesterol helps in removal of the other forms of cholesterol from bloodstream. Desirable level of HDL is 60 mg/dL or (1.6 mmol/L) or above for human consumption. HDL picks up excess cholesterol in blood and takes it back to liver where it's broken down and removed from body. (Regar *et al.*, 2019) [17]. The mean and S.E. of the bird for HDL (mg/dL) at the end of experiment fed with T_1, T_2, T_3 and T_4 rations has found to be 100.07±1.55, 113.43±22.73, 99.53±1.51 and 98.05±4.34, respectively. Analysis of variance for HDL has found non significant under different treatment groups. However, the higher HDL level has observed in T_2 supplementation group (113.43±22.73 mg/dL) followed by T_1, T_3 and T_4 supplementation group. This is might be due to supplementation effect of cumin seeds (*Cuminum cyminum*) leading to hyperglycaemia and results in decrease activity of hepatic lipase, thereby increase concentration of HDL (Andallu and Ramya, 2007; Zare *et al.*, 2014) [1, 21]. Presence of niacin at 2.7 mg per 100g (Milan *et al.*, 2008) [14] in cumin seeds (*Cuminum cyminum*) may be the reason for elevating HDL levels since, niacin acts as putative HDL holoparticle catabolic receptor blocker, and it decreases intrahepatic degradation of HDL and results in increased HDL concentrations.

4. Low Density Lipoprotein (LDL)

LDL stands for low-density lipoproteins and called the "bad" cholesterol because a high LDL level leads to a buildup of cholesterol in arteries. LDL takes cholesterol directly to arteries. This can result in atherosclerosis, a plaque buildup that can even cause heart attack and stroke. An LDL count of 100 mg/dL or less is considered healthy (Regar *et al.*, 2019) [17]. The means and S.E. for LDL (mg/dL) of the bird at the end of experiment fed with T_1, T_2, T_3 and T_4 ration groups have observed 65.82±1.82, 67.92±2.97, 66.56±2.69 and 65.40±0.75, respectively. Non-significant difference has found for LDL under different treatment groups according to analysis of variance. Nevertheless, T_2 treatment group attained higher LDL level (67.92±2.97 mg/dL) followed by T_3, T_1 and T_4 treatment groups. Results indicate that there has no definite trend. However, values of LDL were similar and within the normal range.

5. Very-Low-Density Lipoprotein

VLDL cholesterol is produced in the liver and released into the bloodstream to supply body tissues with a type of fat (triglycerides). VLDL is similar to LDL cholesterol. VLDL is also called "bad" cholesterols because they can contribute to the buildup of plaque in arteries. This buildup is called atherosclerosis. The plaque that builds up is a sticky substance made up of fat, cholesterol, calcium, and other substances found in the blood. VLDL level should be less than 30 mg/dL (Medline, 2019). For T_1, T_2, T_3 and T_4 ration groups, the means and S.E. for VLDL (mg/dL) at the end of experiment have noted 24.27±0.43, 24.62±0.43, 24.86±0.54 and 21.55±0.82, respectively. According to analysis of variance, significant difference (p<0.05) has found for LDL level in T_4 group as compared to other groups, whereas, there has no significance difference has found in between T_1, T_2 and T_3 group.

Overall, cumin seed powder supplementation at different levels are found non significant (p>0.05) for high density lipoprotein and low density lipoprotein level. However, 0.5 percent cumin supplementation group attained higher level for high density lipoprotein and 1.5 Percent cumin supplemented group obtained lower level of low density. Whereas, triglyceride, cholesterol and very low density lipoprotein level at control, 1.5 percent cumin supplemented group has found lower level as compared to 0.5 percent, 1.0 percent cumin supplementation group and control group.

Conclusion

The use of several antibiotics as growth promoters in broiler production may be a serious health risk, to sum up. Because of this negative impact and the goal of "ONE HEALTH," it is vital to develop a better way to delay the use of antibiotics, and as a result, various approaches have been researched globally. There are many health benefits associated with cumin (*Cuminum cyminum*) including those that are antibacterial, antioxidant, antipyretic, antifungal, antidiabetic, anticancer, analgesic, anti-inflammatory, bronchodilator, neuroprotective, contraceptive, and digestive stimulant. Increased level of cumin seed powder supplementation group had significant impact on serum lipid profile in broiler chickens. Higher level of triglyceride, cholesterol, low density lipoprotein (LDL) and very low density lipoprotein (VLDL) are not suitable for consumption because higher level buildup the plaque in arteries known as atherosclerosis which increased the heart stroke therefore LDL and VLDL is known as bad cholesterol, whereas, high density lipoprotein (HDL) refer as good cholesterol because it picks up excess cholesterol in blood and takes it back to liver where it is broken down and removed from the body. However, higher HDL concentration was obtained under 0.5% cumin (113.43±22.73 mg/dL) supplemented group. Birds of T_4 treatment group had significantly lower level of (p<0.05) triglyceride, cholesterol and VLDL as compared to

other treatment groups.

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