Effects of *Mimosa pudica* L. Leaves Extracts on Some Physiological Traits of Broiler Chickens

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Abstract. A total of 150 Ross 308 day-old broiler chicks were brought, and they were unsexed. All the requirements were prepared in advance before introducing the meal. The chicks were distributed randomly into five treatments, with three replications for each treatment ,10 birds for each replicate. The treatments were as follows: T1 (control), T2: (addition of the aqueous extract of *Mimosa pudica* L. leaves at a rate of 1 ml / liter of drinking water), T3: (addition of the aqueous extract of *Mimosa Pudica* L. Leaves at a rate of 2 ml / liter of drinking water. T4: (addition of the alcoholic extract of *Mimosa pudica* L. leaves at a rate of 1 ml / liter of drinking water). T5: (addition of the alcoholic extract of *Mimosa pudica* L. leaves at a rate of 2 ml / liter of drinking water). Total cholesterol, low-density lipoprotein (LDL-C), very low-density lipoprotein (VLDL-C), high-density lipoprotein, and liver enzymes (GOT and GPT) were measured. The results indicated that there was a significant decrease in the concentration of the total cholesterol and liver enzymes (GOT and GPT), a significant increase in the level of very low-density lipoprotein (VLDL-C) and high-density lipoprotein for the addition treatments compared to the control treatments.

Keywords. *Mimosa Pudica*, Broiler Chickens, Physiological traits.

1. Introduction

The rapid spread of diseases and continuous decimation have become among the most important problems facing poultry farming, so in light of this challenge, the pharmaceutical industry began to develop a new generation of antibiotics to combat microorganisms as well as the use of alternative methods of treatment [1]. Among these methods is the use of medicinal plants, commonly used as alternative food additives to industrial chemical additives, as they boost the body's immunity by stimulating the immune system [2]. Besides, their action is also related to improving the environment of the digestive tract of the bird by inhibiting the growth of pathological bacteria and increasing the growth of beneficial bacteria [3].

All this motivated researcher to use medicinal plants, which have been shown to have the ability to improve the productive, physiological, and immunological traits of domestic birds [4]. Among these plants with medicinal benefits is the *Mimosa pudica* L. plant [5].

Mimosa pudica L. plant can be used in poultry diets since it is acceptable for the consumer because it is natural and already included in the human diet [6]. The shy plant belongs to the family Leguminosae (Fabaceae), which is one of the richest plant species due to its nutritional and therapeutic value for humans and animals. It includes about 730 genera and more than 19,400 species. It was found that the ethanolic extract of the leaves of the plant affects lowering blood sugar [7]. Also, the aqueous extracts of the leaves are used as antioxidant enzymes such as Superoxide dismutase, peroxidase, and polyphenol oxidase [8]. It was also found that the aqueous and methanolic extract of the seeds, leaves, and stems of the shy plant inhibited the activity of microorganisms [7]. Furthermore, it was also found that the alcoholic extracts of its leaves reduce the level of cholesterol in the blood [6].
Hyperlipidemia is defined as high concentrations of plasma lipids such as total cholesterol, low lipoprotein (LDL-C), very low-density lipoprotein (VLDL-C), and low concentrations of high-density lipoprotein [9]. Hyperlipidemia is one of the health problems that affect people's lives as it is closely associated with some diseases such as atherosclerosis and coronary heart disease, which are among the most common causes of death in the world [10].

2. Materials and Methods

2.1. Preparation of Plant Extracts

Mimosa pudica L. plant was collected from Maysan governorate and Breeding took place in the animal production field of the Agricultural Research Station / College of Agriculture / Basra University and operation laboratories in University of Misan, Ethical Approval No. uM.SCI.2023.6. in order to study the effectiveness of the plant in inhibiting cholesterol and studying some Physiological traits. After that, the plant was ground with a mill.

2.2. Aqueous Extract

To obtain the aqueous extract of the sensitive plant, the method mentioned in [11] was used. Thus, 100 g of the sensitive plant powder was weighed and placed in a 1- liter glass beaker and 500 milliliters of distilled water was added to it. Then the mixture was placed in a shaking incubator for a period of (24) hours at a temperature of 35 °C. Then the mixture was filtered with gauze to be centrifuged at a 3000 rpm speed for 10 minutes.

2.3. Alcoholic Extract

The alcoholic extraction method of [12] was adopted in preparing the plant extract. Accordingly, 100 gm of the powder of the sensitive plant was weighed and 500 ml with 98% concentration of ethyl-alcohol was added, mixed well, and left for 24 hours at the laboratory temperature (25 °C). Then the extract was filtered using whatman No1 filter paper and the filtrate was concentrated in a rotary vacuum evaporator at a temperature of 40°C to get rid of the solvent. Afterwards, the filtrate was left at room temperature to get rid of the solvent completely until a very viscous concentrated substance was obtained. Finally, an amount of 50 ml of distilled water was added for every 2 g of this substance to prepare the concentrations used in the study.

2.4. Study Treatments

T1: (control), T2: (addition of the aqueous extract of *Mimosa pudica* L. leaves at a rate of 1 ml / liter of drinking water), T3: (addition of the aqueous extract of *Mimosa Pudica* L. leaves at a rate of 2 ml / liter of drinking water. T4: (addition of the alcoholic extract of *Mimosa pudica* L. leaves at a rate of 1 ml/liter of drinking water). T5 (addition of the alcoholic extract of *Mimosa pudica* L. leaves at a rate of 2 ml/liter of drinking water).

2.5. Traits Investigated

2.5.1. Cholesterol Concentration

The concentration of cholesterol in blood serum was measured by using a measurement kit prepared by the English company, Rando, according to the attached instructions. A spectrophotometer was used

to read the samples at a wavelength of 500 nanometers and the concentrations were calculated according to the following equation [13]:

Cholesterol concentration (mg/100 ml)=(Sample reading)/(reading Standard cholesterol) x 200

2.5.2. High-Density Lipoproteins (HDL)

The process of measuring high-density lipoproteins in blood serum was carried out using a measuring kit and according to the working, method described on the measuring kit and prepared by the Egyptian Biotechnology Company. The measurement was carried out using a spectrophotometric device after adjusting the wavelength to 600 nm and then applying the following equation:

HDL (mg/dl)=(Sample absorbance)/(absorbance of the Standard solution) x calibrator concentration

2.5.3. Low-Density Lipoproteins (LDL)

Where it is derived mathematically through a special equation based on the values of cholesterol, triglycerides, and high-density proteins, the LDL concentration was calculated according to the following equation [13]:

LDL concentration=VLDL cholesterol-HDL

VLDL=(Triglycerides)/5

2.6. Measuring GOT Enzyme Activity

A ready-made assay kit manufactured by the French company, Biomerieux, was used. A spectrophotometer, at a wavelength of 505 nm was utilized, and the AST enzyme activity (unit/liter) was found by using a standard curve prepared for this purpose.

2.7. Measuring GPT Enzyme Activity

A ready-made assay kit manufactured by the French Biomerieux company was used. A spectrophotometer at a wavelength of 505 nm was utilized, and the activity of ALT enzyme (unit/liter) was extracted using a standard curve prepared for this purpose.

2.8. Statistical Analysis

The software SPSS was used for analyzing experimental data using a completely randomized design (One-way ANOVA) [14]. At the 0.05 percent significance level, significant variations between means were also evaluated using Duncan's multiple range tests [15].

3. Results and Discussion

Table (1) indicates the effect of adding the aqueous and alcoholic extract of the *Mimosa pudica* L. plant to the drinking water of broiler chickens. The table shows a decrease in the addition coefficients of the concentration of cholesterol, LDL, and VLDL compared to the control treatment. The reason behind this is the fact that the *Mimosa pudica* L. substance contains active substances, including saponin. They have a role in reducing inflammation or inhibiting the formation of cholesterol by inhibiting the activity of the brewer, HMG-CoA. Or else, because the saponin forms a complex compound with cholesterol in the gastrointestinal tract. Thus, it inhibits its absorption in the small intestine or increases the rate of excretion of cholesterol and bile acids with faeces. This takes place because the sensitive plant contains fibers effective in reducing the duration of the stay of cholesterol and bile acids in the intestine, and then reducing their absorption rate. This process leads to an increase in their excretion with faeces [16]. Besides, a significant superiority of the HDL concentration in the addition treatments was found compared to the control treatment. Likewise, the aqueous and alcoholic extracts of the sensitive plant also reduce the level of cholesterol in the blood by increasing the rate of catabolism of LDL. In addition, they may prevent the synthesis of cholesterol and delay its absorption. They also act as antioxidants. They act like the drugs, Atorvastatin and Probucol. The plant also improves the microbial content in the gastrointestinal tract, hence increasing the activity of beneficial

bacteria, which play an important role in lowering the concentration of cholesterol by carrying cholesterol from blood to the liver to be digested and excreted in bile [17].

Table 1. Effect of adding aqueous and alcoholic extracts of *Mimosa pudica* L. to drinking water on the level of the concentration of (cholesterol, HDL, LDL, and VLDL mg/100 ml in blood serum) (mean ± standard error).

Treatments	Cholesterol (mg/100 ml of blood serum)	HDL (mg/100 ml of blood serum)	LDL (mg/100 ml of blood serum)	VLDL (mg/100 ml of blood serum)
T1	135.22 ± 2.88 A	62.33 ± 1.45 D	57.66 ± 2.18 A	15.00 ± 1.15 A
T2	125.62 ± 22.8 B	73.46 ± 1.73 C	42.46 ± 4.40 B	9.33 ± 1.88 B
T3	118.66 ± 2.68 B	81.75 ± 1.15 Ab	28.66 ± 3.12 C	9.86 ± 1.12 B
T4	122.33 ± 1.45 B	78.86 ± 1.11 B	34.33 ± 1.20 C	10.76 ± 1.25 B
T5	110.00 ± 2.22 C	83.23 ± 1.14 A	19.00 ± 2.00 D	8.16 ± 1.35 B
Significance level	*	*	*	*

(*) Vertically different characters between treatments` averages mean that there are significant differences ($P < 0.05$).

T1: (control), T2: (adding the aqueous extract of the *Mimosa pudica* L. plant leaves at a rate of 1 ml/liter of drinking water), T3: (adding the aqueous extract of the *Mimosa pudica* L. plant leaves at a rate of 2 ml/liter of drinking water), T4: (adding the alcoholic extract of the *Mimosa pudica* L. plant leaves at a rate of 1 ml/liter of drinking water), T5: (adding the alcoholic extract of the *Mimosa pudica* L. plant leaves at a rate of 2 ml/liter of drinking water).

Table (2) indicates the effect of adding the aqueous and alcoholic extract of the sensitive plant to the drinking water of broiler chickens. The table shows a decrease in the concentration of GOT and GPT enzymes. This decrease in the concentration of GOT and GPT enzymes in the blood serum in the additional treatments is due to the effect of the active substances present in the sensitive plant powder which act as antioxidants. These substances include the two-terpene phenolic compounds, Carnosic acid and Carnosol. Carnosic acid is considered the most effective antioxidant, which curbs free radical damage and thus protects polyunsaturated fatty acids and liver membranes, and preserves the optional permeability characteristic, which leads to the non-infiltration and leakage of these enzymes from inside the cell to the outside. Similarly, the presence of some active compounds in the sensitive plant such as the flavonoids and the saponins, protects liver tissue cells against degradation [18,19].

Table 2. Effect of adding aqueous and alcoholic extracts of *Mimosa pudica* L. plant leaves to drinking water on the level of the (GOT, GPT) enzymes` concentration (mean ± standard error).

Treatments	Enzyme GPT	Enzyme GOT
T1	33.66 ± 2.33 A	37.33 ± 1.46 A
T2	22.33 ± 1.45 B	25.00 ± 1.73 B
T3	23.22 ± 1.25 B	22.66 ± 1.66 B
T4	24.00 ± 1.73 B	25.00 ± 1.15 B
T5	19.33 ± 1.76 B	19.24 ± 1.40 B
Significance level	*	*

(*) Vertically different letters between the averages of treatments mean that there are significant differences ($P < 0.05$).

T1: (control), T2: (adding the aqueous extract of the Mimosa pudica L. plant leaves at a rate of 1 ml/liter of drinking water), T3: (adding the aqueous extract of the Mimosa pudica L. plant leaves at a rate of 2 ml/liter of drinking water), T4: (adding the alcoholic extract of the Mimosa pudica L. plant leaves at a rate of 1 ml/liter liter

of drinking water), T5: (adding the alcoholic extract of the Mimosa pudica L. plant leaves at a rate of 2 ml/liter of drinking water).

Conclusion

It is concluded that aqueous and alcoholic extract of Mimosa pudica leaves at levels of 100 mg per liter have the potential to decrease the concentration of cholesterol, LDL, and VLDL compared to the control treatment. Moreover, decrease in the concentration of GOT and GPT enzymes in broiler chickens.

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