

## Research Article

# Biochemical Effect of Water Based Infusion of *Withania somnifera* in Broiler Production

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**Abstract** | Hyperlipidemia is the term refers to high lipids contents in the blood. These lipids content can cause the atherosclerosis by blocking the arteries canal which increase the risk factors associated with heart attack. Atherosclerosis is also associated with development of diabetes, high blood pressure and kidney failure. Hypercholesterolemia is mainly caused by high fat diet, obesity and diabetes. Hypolipidemic and hypoglycemic effect of water based infusion of *Withania somnifera* was investigated in broiler chicks. One hundred and twenty (120) day-old broiler's chicks were alienated into four treatment groups namely WST-0, WST-I, WST-II and WST-III with three replication. Group WST-0 was kept as a control, while WST-I, WST-II and WST-III were treated with *W. somnifera* water based infusion @ 10, 20 and 30ml/lit respectively. The means were compared by using CRD as statistical model for analysis. Lipid profile and serum glucose was significantly improved. Lipid profile and serum glucose was significantly reduced in all treated groups. Mean cholesterol was (157.66 mg/dl), triglyceride (65.64 mg/dl), HDL (58.88 mg/dl) while no alteration in LDL contents. Significantly effect of water based infusion was notice on mean serum glucose (73.83 mg/dl) Observation of the study indicating that water based infusion of *W. somnifera* are a potential source of hypoglycemic and hypolipidemic agents.

**Received** | March 29, 2016; **Accepted** | July 10, 2016; **Published** | August 29, 2016

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**Citation** | Mushtaq, M., U. Sadique, N. Chand, I. Ahmed, S.S.A. Shah, I. Ahmad, Imran-Ullah and M. Shah. 2016. Biochemical effect of water based infusion of *Withania somnifera* in broiler production. *Meat Sciences and Veterinary Public Health*, 1(1): 17-20.

**Keywords** | *Withania somnifera*, Cholesterol, Triglyceride, Glucose, broiler

## Introduction

Hyperlipidemia is an umbrella term that refers to any of several acquired or genetic disorders that result in a high level of lipids (fats, cholesterol and triglycerides) circulating in the blood. These lipids can enter the arteries and increase the risk of developing atherosclerosis (hardening of the arteries), which can lead to stroke, heart attack and there is urgent need to amputate. The risk of atherosclerosis is higher if

developed diabetes, high blood pressure and kidney failure. Hyperlipidemia is most commonly associated with high-fat diets, a sedentary lifestyle, obesity and diabetes (Moneta, <https://vascular.org/patient-resources/vascular-conditions/hyperlipidemia>). Medicinal plants have been abundantly used as traditional medicine in health care of both human and animals since time immemorial throughout the world, especially in developing and under developed countries. Keeping in view, the continuous use and the vital con-

tributing role of medicinal plants, the documentation of herbal plants is necessary because they are likely to be more important in future, due to escalating costs of drugs and the focus on organic products in most of the developing countries. A few examples of herbs, used to treat livestock diseases in rural areas are *Adenium multiflorum* (impala lily), *Aloe spicata*, *Aloe vera* (burn plant), *Allium sativum* (garlic) and *Withania somnifera*. The herb "*Withania somnifera*" has several pharmacological properties. It is used as anti-stress (Khare, 2007), hypolipidemic and hypoglycemic (Rajangam et al., 2009). *W. somnifera* is an Ayurvedic medicinal plant, which is popular as a local medicine in several diseases. The hypocholesterolemic and antioxidant effects of *W. somnifera* were investigated in hypocholesterolemic male albino rats (Visavadiya and Narasimhacharya, 2007). Based on these significant medicinal importance of the plant, a research study was planned in broiler chicks to investigate its effect on Serum lipid profile and serum glucose level.

## Materials and Methods

The research trails were conducted for the biochemical effect of water based infusion of *W. somnifera* in broiler chicks.

### Experimental Design

One hundred and twenty (120) day-old broiler chicks were alienated into four groups namely WST-0, WST-I, WST-II and WST-III, respectively. Each group carrying three replicate having ten birds constituted. The design was established in such way that group WST--0 was kept as control while other groups WST--I, WST--II and WST--III were given *W. somnifera* extracts @ 10, 20, 30 ml/L of water. Chicks were reared in an open sided house in pens. Necessary materials were provided in each pen to maintain sound management and environmental conditions. Experiment was lasted for 35 days.

### Preparation of *Withania somnifera* Powder

Fresh healthy plant of *W. somnifera* was collected from different hilly areas of Khyber Pakhtunkhwa in summer season at flowering stage. The identification of the herb was authenticated by Department of Weed Science, KPK Agricultural University Peshawar, Pakistan. The leaves, fruits and roots were separately air dried, and pulverized with the help of an electric grinder, and were mixed at the ratio of 1:1:1 through electric balance to get a uniform mixture of these

parts (leaves, fruits and roots). The dried powder of the mixture was subjected to extraction with water at room temperature (25°C) and boiled for two hours. The extract obtained was filtered through Whatman filter paper (No. 4), to get pure extract of the mixture. The extracts were used for experiment.

### Data Recorded

Data was recorded for lipid profile and serum glucose. Serum was obtained from birds and used for investigation of lipid profile (cholesterol, triglyceride, LDL, HDL) and serum glucose level by using Elitech Kit technique as described by Werner et al. (1981).

### Data Analysis

Average results are expressed as mean  $\pm$  S.E and evaluated for statistical significance with an analysis of variance (Complete Randomize Design) test as described by Steel and Torrie (1981).

## Results

### Effects of *Withania somnifera* infusion on Cholesterol and Triglyceride

The effect of different level of herbal infusions on the experimental and control chicks was found significant. Group WST- II was more effective than WST- I and WST- III. Treatment affected the ( $P < 0.05$ ) mean serum cholesterol and triglyceride. Average cholesterol per chicks for the four experimental groups were 254.16, 159.83, 157.66 and 163.66 mg/dl, while triglyceride was 153.67, 85.03, 65.64 and 72.94 mg/dl respectively, as presented in Table 1.

### Effects of *Withania somnifera* Infusion on HDL

Hypolipidemic effects of aqueous extract of *W. somnifera* on HDL (High Density Lipoprotein) is given in Table 1. Because of the "positive control" *W. somnifera* extract WST- II was more potent than WST- I or WST- III. Analysis of variance indicated that significant ( $P < 0.05$ ) difference in the mean serum high-density lipoprotein values among the treated groups. Average HDL for the four experimental groups was 80.39, 62.36, 58.88 and 67.00 mg/dl, respectively.

### Effects of *Withania somnifera* Infusion on LDL

Because of the "positive control" *W. somnifera* extract WST- II was more potent than extract WST- I or WST- III. Analysis of variance indicated that serum low density lipoprotein values was found non-significant ( $P > 0.05$ ) among the treatments groups. Average

**Table 1:** Mean Cholesterol, Triglyceride, HDL, LDL and Glucose mg/dl in broiler chicks fed different levels of *Withania somnifera*

| Group   | Cholesterol mg/dl              | Triglyceride mg/dl             | HDL mg/dl                      | LDL mg/dl        | Glucose mg/dl                  |
|---------|--------------------------------|--------------------------------|--------------------------------|------------------|--------------------------------|
|         | Mean $\pm$ SE                  | Mean $\pm$ SE                  | Mean $\pm$ SE                  | Mean $\pm$ SE    | Mean $\pm$ SE                  |
| WST-0   | 254.16 <sup>a</sup> $\pm$ 5.83 | 153.67 <sup>a</sup> $\pm$ 3.75 | 80.39 <sup>a</sup> $\pm$ 3.30  | 65.16 $\pm$ 4.72 | 104.16 <sup>a</sup> $\pm$ 3.68 |
| WST-I   | 159.83 <sup>b</sup> $\pm$ 4.36 | 85.03 <sup>b</sup> $\pm$ 3.54  | 62.36 <sup>cb</sup> $\pm$ 1.06 | 63.36 $\pm$ 2.09 | 86.16 <sup>b</sup> $\pm$ 3.07  |
| WST-II  | 157.66 <sup>b</sup> $\pm$ 1.83 | 65.64 <sup>c</sup> $\pm$ 1.20  | 58.88 <sup>c</sup> $\pm$ 1.09  | 62.35 $\pm$ 2.02 | 73.83 <sup>c</sup> $\pm$ 1.49  |
| WST-III | 163.66 <sup>b</sup> $\pm$ 7.04 | 72.94 <sup>c</sup> $\pm$ 4.59  | 67.00 <sup>b</sup> $\pm$ 1.32  | 66.33 $\pm$ 1.35 | 92.16 <sup>b</sup> $\pm$ 3.19  |

Means in the column having different superscript are significant at  $\alpha=0.05$

LDL for the four experimental groups are presented in Table 1. The LDL found lower in group WST- II reflects positive effect of medicinal plants.

### Effects of *Withania somnifera* Infusion on Serum Glucose

Administration of *W. somnifera* aqueous extract WST- II per day dose for 35 days resulted in a significant decrease in serum glucose as compared to aqueous extract WST- I or WST- III treated and control birds. Analysis of variance indicate that significant ( $P<0.05$ ) difference was observed in the mean glucose levels among the treated groups. Average serum glucose for the four experimental groups are presented in Table 1.

## Discussion

Triglyceride level decreased due to the usage of medicinal plants which contains active ingredient and literature has shown that it has been found to liquefy blood fat, thus causing the removal of fat from the arterial. With less fat clumping at the muscles of the arteries, cholesterol levels are bound to go down, resulting into decrease in the levels of triglyceride. In a clinical study, an herbal cocktail containing withania used as an adjunct to conventional anti-ischemic drugs has been found to reduce total cholesterol, triglycerides and increase high density lipoprotein cholesterol in the post myocardial infarction patients (Dwivedi, et al., 2000). The findings of present study agree with the finding of Visavadiys and Narasinhacharya (2007), who investigated the hypocholesteremic and antioxidant effect of root powder of *W. somnifera* added to the diet @ 0.75 and 1.5 gm / rat / day, hypercholesteremic animals, significant decreases in total lipids (-40.54%; -50.69%), cholesterol (-41.58%; -53.01%) and triglycerides (-31.25%; -44.85%) in serum. Rajangam et al. (2009) investigated the hypolipidemic effect *W. somnifera* and found that reduction in lipids profile was significant in experimental rats. Mary et al. (2003) demonstrated the antiatherogenic activity

of Caps HT2, a botanical medicine comprising of several plants including *W. somnifera* against vascular intimal damage and atherogenesis which leads to various types of cardiovascular diseases. The formulation scavenges free radicals, inhibited lipid peroxidation, delayed the plasma re-calcification time and enhanced the release of lipoprotein lipase enzyme. It also inhibited platelet aggregation comparable to heparin. The formulation altered atherogenic index and reduced the body weight with rise of high density lipoprotein cholesterol levels in hyperlipidemic rats. Another study of Sarangi et al. (2013) on *W. somnifera* as hypolipidemic agent in diabetic rats and found that the leaf and root extracts significantly restore the hyperlipidemia in diabetic rats.

Medicinal plant used in this study is known to have antioxidant properties which enhanced insulin secretion and resulted in decrease in the value of glucose level. Significant decrease in the blood glucose level may be attributed to improving of the antioxidant system in cells to produce insulin. Gorelick et al. (2015) reported the withaniferin-A from *W. somnifera* that it significantly alter the serum glucose level. Sarangi et al. (2013) explores the possibilities of using the root and leaf extracts of an important plant *W. somnifera* as hypoglycemic in diabetic rats. The leaf and root extract of *W. somnifera* significantly restore the level of serum glucose. Findings of our study could agree with the result of Sarika et al. (2006), who studied type 1 diabetes, induced in albino rats by a single intraperitoneal injection of streptozotocin (60 mg/kg), rats with fasting blood glucose (FBG) more than 250 mg/dl, 72 h after STZ administration, were treated with extracts of medicinal plant *W. somnifera* found significant decrease in FBG levels from STZ-induced hyperglycemia, after 3 weeks of treatment with standardized extracts of *W. somnifera*. Rajangam et al. (2009) investigated the potential of *W. somnifera* against the hyperglycemia and found that withania significantly

alter the serum glucose level which is in-line to the present study.

## Conclusion

It is concluded from the findings of present research work that *W. somnifera* infusion WST- II is a potential source to normalize lipid profile and reduce glucose level.

## Acknowledgment

I acknowledge with gratitude to Prof. Dr. Muhammad Subhan Qureshi (Dean, FAHVS) for providing us the opportunity to publish this research work.

## Conflict of Interest

There exists no conflict of interests.

## Authors' Contribution

MM conducted the research work. All the other authors contributed in research activities and manuscript preparation.

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