

## Original Research Article

# **Effect of Ethanol Extract of *Moringaoleifera* on the Rat Model of Hyperlipidemia Due to High Fat**

### **Abstract**

The art or practice of herbal remedies refers to the use of herbs and herbal treatments for the purpose of maintaining health and preventing, treating, or curing sickness. In some areas, herbal treatments can also be referred to as herbal medicine. To assess the lipid profiles of *Moringa oleifera* extract, rats were studied. For both the SGPT and the SGOT, it was seen that groups 5 and 6 exhibited statistically significant ( $p < 0.05$ ) outcomes in the case of the SGPT. However, in the case of the SGOT, there were no statistically significant findings. When conducting the renal function test, it was observed that the levels of creatinine and urea were statistically significant ( $p < 0.05$ ) in the cases of groups 4, 5, and 6. In the case of high-density lipoprotein (HDL) and low-density lipoprotein (LDL), groups 4, 5, and 6 showed statistically significant findings ( $p < 0.05$ ) in HDL levels, while groups 5 and 6 showed statistically significant LDL levels. The triglyceride levels in the group were found to be statistically significant ( $p < 0.05$ ), while the findings obtained from groups 5 and 6 were also found to be statistically significant. The study revealed that *M. oleifera* has anti hyperlipidemic activity.

**Keywords:** Herbal medicine, *Moringa oleifera*, HDL, LDL, Phytochemicals.

### **Introduction**

The liver, the largest glandular organ, is responsible for controlling the majority of a person's bodily functions. Numerous times during the day, the whole blood supply of an individual goes through the liver. The liver is very critical for human metabolism. [1]. The quantity of lipoproteins and triglycerides (TG), which are both influenced by genetic and environmental factors, is a sign of the lipid metabolism process. Dyslipidemia may arise from either an inherent, exogenous, or a mix of hereditary susceptibility and outside influences [2]. Statins are the established treatment for hypercholesterolemia. Their effectiveness is well recognised, and when used at the highest permissible dosage in conjunction with ezetimibe, they often enable the attainment of LDL-C objectives [3]. But these drugs associated with damage of liver enzymes, cancer, diabetes, renal alternation and stroke etc[4]. So medicinal plant researcher are searching for new treatment with lower cost and fewer side effects. Some chemical components derived from medicinal plants may have therapeutic uses, say specialists in the subject. It follows that researchers are always on the lookout for new herbal cures and other plant-based therapies to treat a wide range of illnesses [5]. While phytotherapy is based on scientific study, herbalism is more concerned with the practical applications of medicinal plants. Plants have played a significant role in human medicine for thousands of years due to the wide diversity of chemicals they contain, many of which have medicinal characteristics [6]. The vast variety of chemical components found in medicinal plants allows them to exert a broad spectrum of pharmacological and therapeutic effects. Tanning agents, glycosides, alkaloids, saponins, polysaccharides, essential oils, terpenoids, resins, and plant lipids are all examples of such components [7-9]. Modifying plants genetically allows for the precise regulation of chemical concentrations, allowing for the desired therapeutic effect. Reverse genetics has many potential applications, one of which is to enhance the production of secondary metabolites like alkaloids [10]. Recent scientific progress around the world has led to more research into the healing properties of plants [11]. This is because plants are safe, have strong pharmacological activity, and are more cost-effective than man-made drugs.

*Moringa oleifera* has nutritional and therapeutic features as a result of its tremendous medical potential; however, this is only the case if the economic worth of the plant's nutritional value, medicinal applications, and animal feed is significant. This tropical deciduous tree, which is endemic to the southern Himalayas in northern India, is a perennial and belongs to the Moringaceae family. Antioxidant, anti-inflammatory, neuroprotective, hypoglycemic, and blood

lipid-lowering are just a few of the nutritional and medicinal benefits of *Moringa oleifera* extracts. *Moringaoleifera's* rich phytochemical content—including flavonoids, glucosinolates, isothiocyanates, and phenolic acids—is strongly associated with its positive effects [12].

The purpose of our present study is to evaluate the anti-hyperlipidemic effects of *Moringaoleifera*.

## **MATERIALS AND METHODS**

### **Plant Collection and Extract Preparation**

*Moringa oleifera* were collected from local market of Dhaka. The material was authenticated by National herbarium, Bangladesh. Firstly *Moringaoleifera* was cleaned properly with water and it was then air-dried. Finally dried leaves were crushed in powder. The powder was soaked for 10 days in 70% ethanol. Vigorous shaking was also performed occasionally. Next, the solution was filtered. The collected filtrate was dried in a rotary evaporator at a low temperature and pressure. Finally, the crude residue was subjected to the required pharmacological testing.

### **Drugs and Chemicals**

Atorvastatin drug was obtained from inceptapharmaceuticals as a gift sample. Ethanol were bought from Taj Scientific store.

### **Experimental Animal Procurement, Nursing, and Grouping**

A total of 90 male rats weighing between 120 and 150 grams were obtained from Jahangirnagar University in Savar, Dhaka. Each of them was housed in a climate-controlled environment (temperature  $25\pm 3^{\circ}\text{C}$ , relative humidity  $55\pm 5\%$ , and a 12-h light/dark cycle) at the University of Dhaka's Institute of Nutrition & Food Science (INFS). They were given a conventional food and were permitted to drink clean water. All of the animals were maintained in this habitat for at least one week prior to the research for adaptation. All experimental methods followed the recommendations of the Institutional Animals Ethics Committee (IEAC). 90 rats were randomly distributed into 9 groups where each group contains 10 rats.

**High Fat Diet:** The high-fat diet was modified based on the composition supplied by Levin and Dunn-Meynell. The high fat diet is composed of 50% lipid, 40% carbohydrate, and 10% protein. The diet's composition is shown in Table 1.

**Table 1:** Composition of high fat diet

Food Ingredients	Composition
Lipid (50%)	Milk powder (10%) Ghee (30%) Mutton fat (40%) Coconut oil (10%) Butter (10%)
Carbohydrate (40%)	Boiled rice (40%) Smashed potato (40%) Boiled corn (20%)
Protein (10%)	Dry powdered prone (40%) Dry boiled mutton (20%) Cheese (20%) Egg (20%)

After mixing the ingredients thoroughly, the high fat diet was given to the rats to induce obesity for 10 weeks. [13]

### Experimental design

Rats were individually weighed and then divided into nine independent groups for research on anti-hyperlipidemic action. The distribution of rodents among the groups was based on their body weight, with each group consisting of five rats. The atorvastatin control group in Table 1 shows rats that were given atorvastatin with a high-fat diet since using simply atorvastatin would result in the animals dying. N/A indicates that rats in this group did not receive any therapeutic treatment.

**Table 2:** Antihyperlipidemic activity analysis

Group number	Group Status	Treatment specimen & Dose	Group Abbreviation
1	Negative Control	Physiological Saline	N
2	Positive Control	High Fat Diet	HF
3	High Fat Diet + Atrovastatin	High Fat Diet + Atrovastatin	HFD + ATV
4	High Fat Diet + <i>M. oleifera</i>	High Fat Diet+ MO <sub>250</sub>	HFD + MO <sub>250</sub>
5	High Fat Diet + <i>M. oleifera</i>	High Fat Diet + MO <sub>500</sub>	HFD + MO <sub>500</sub>
6	High Fat Diet + <i>M. oleifera</i>	High Fat Diet + MO <sub>750</sub>	HFD + MO <sub>750</sub>
7	<i>M. oleifera</i>	MO <sub>250</sub>	MO <sub>250</sub>
8	<i>M. oleifera</i>	MO <sub>500</sub>	MO <sub>500</sub>
9	<i>M. oleifera</i>	MO <sub>750</sub>	MO <sub>750</sub>

### Evaluation of anti-hyperlipidemic Activity

For this experiment, 90 rats were randomly picked and equally divided into nine groups

**Table 3:** Application of treatment efficacy

Group Number	Group Specification	Treatment species	Dose treatment species (mg/kg)	Abbreviation of Groups
1	Negative control	Physiological saline	10 ml/kg	N
2	High Fat	N/A	N/A	HF
3	HF+At <sub>10</sub>	Atrovastatin 10mg/kg	10	At <sub>10</sub>
4	HF+MO <sub>250</sub>	<i>Moringa oleifera</i>	250	MO <sub>250</sub>
5	HF+MO <sub>500</sub>	<i>Moringa oleifera</i>	500	MO <sub>500</sub>

6	HF+MO <sub>750</sub>	<i>Moringa oleifera</i>	750	MO <sub>750</sub>
7	MO <sub>250</sub>	<i>Moringa oleifera</i>	250	MO <sub>250</sub>
8	MO <sub>500</sub>	<i>Moringa oleifera</i>	500	MO <sub>500</sub>
9	MO <sub>750</sub>	<i>Moringa oleifera</i>	750	MO <sub>750</sub>

### **Biological Sample Collection.**

Blood was drawn from the animal as soon as its heart was punctured and transferred to a micro centrifuge tube after the killing. The samples were centrifuged at 5,000 rpm for 5 minutes to create the supernatant fluid. Biochemical testing subsequently required the transfer of this fluid to an additional micro centrifuge tube. We carefully took the kidney and liver from the animal after sacrifice and cleaned them in ice-cold saline to assess their function.

### **Estimation of Biochemical Parameters**

Lipid profile, kidney, and liver function tests were performed by using Humaluzer 3000.

### **Statistical analysis:**

All of our findings (raw data) in terms of numerical parameters were recorded and analyzed on a broadsheet using the MS Excel application. The gathered data were subjected to descriptive statistics, with the findings reported as mean SD. To evaluate statistical significance, we used the SPSS 16 software's "One-way Anova test" to interpret inter-group heterogeneity in terms of several biological factors. The occurrences are considered statistically significant since the 'p' value was less than 0.05 ( $p < 0.05$ ).

### **Results and discussion:**

For both the SGPT and the SGOT, it was seen that groups 5 and 6 exhibited statistically significant ( $p < 0.05$ ) outcomes in the case of the SGPT. However, in the case of the SGOT, there were no statistically significant findings. There were two other investigations that came to the same conclusions [14, 15]. When conducting the renal function test, it was observed that the

levels of creatinine levels were statistically significant ( $p < 0.05$ ) in the cases of groups 4, 5, and 6 (Table 4). Also in case of urea the results were statistically significant in groups 4,5 and 6. Two separate investigations [16, 17] came to the same conclusions about the subject which provide as the same results of our experiment. When examining the levels of high-density lipoprotein (HDL) and low-density lipoprotein (LDL), it was seen that groups 4, 5, and 6 exhibited statistically significant discoveries ( $p < 0.05$ ) in HDL levels. On the other hand, groups 5 and 6 further showed statistically significant levels of LDL. It was determined that the triglyceride levels in Group 4 were statistically significant ( $p < 0.05$ ). Additionally, the data obtained from groups 5 and 6 were also found to be statistically significant in the case of total cholesterol. Two further studies produced the same findings of our investigation [18, 19].

**Table 4:** Lipid profile of *Moringa oleifera*:

	SGPT	SGO T	Creati- nine	Urea	TC	HDL	LDL	TG
C	36.28±4.2 5	36.52 ±3.12	0.5±0.0 5	29.49± 2.32	94.82±3.19	66.25±3.62	35.22±3. 26	54.28±3.29
HF	95.32±6.8 0	88.73 ±8.18	2.24±0. 06	87.72± 6.91	177.84±9.5 3	38.54±3.84	69.32±5. 69	104.24±6.26
HF+At <sub>10</sub>	74.59±2.0 9	74.33 ±6.28	1.1±0.0 8	59.51± 6.39	119.26±7.5 6	57.36±4.58	45.40±4. 28	70.64±5.94
HF+MO <sub>250</sub>	93.28± 6.51	88.18 ±3.59	1.97±0. 08*	82.39± 4.81*	172.42±6.2 1	42.60±2.81 *	37.54±3. 57	97.29±6.82*
HF+MO <sub>500</sub>	90.27±6.5 8*	87.29 ±8.13	1.70±0. 07*	78.30± 3.59*	166.17±7.5 3*	47.84±5.33 *	41.66±4. 58*	93.10±5.28
HF+MO <sub>750</sub>	86.81±5.2 9*	85.52 ±3.61	1.29±0. 05*	74.53± 5.60*	162.23±6.1 8*	54.54±4.28 *	45.08±3. 28*	90.25±6.73
MO <sub>250</sub>	34.67±2.6 2	39.42 ±2.85	0.60±0. 08	28.08± 3.06	90.18±4.51	63.28±4.20	37.30±2. 21	56.29±4.10
MO <sub>500</sub>	36.37±4.1 2	34.73 ±2.80	0.70±0. 06	32.53± 2.84	92.30±2.81	66.53±3.29	35.18±3. 26	53.29±3.10

MO <sub>750</sub>	34.12±3.2	35.79	0.9±0.0	30.80±	94.95±3.22	65.19±4.24	38.42±4.	55.53± 4.23
	9	±3.18	8	2.35			20	

**Note:** The results were expressed in Mean±SEM (standard mean error) \*p< 0.05, \*\*p< 0.01, and \*\*\*p< 0.001 were considered as statistically significant. The statistical analysis followed by one-way analysis of variance (Dunnett's test) compared to the control.

## Conclusion

Within the scope of this investigation, the anti-hyperlipidemic property of *Moringaoleifera* ethanolic extract were investigated. Based on the findings of this research, it seems that an ethanol extract derived from the plant *M. oleifera* may be able to provide protection against excessive cholesterol, damage to the liver, and impaired kidney function. As a result, more research is necessary in order to determine the active components in the entire extract that have the ability to reduce hyperlipidemia. After the active chemicals have been discovered, it is possible to conduct a comprehensive investigation.

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