

## **An in Vivo Assessment of Hepatoprotective Activity of *Aloe barbadensis* on Rat Model with Safety Profile Analysis**

### **Abstract**

The art of employing herbs and herbal medications to preserve health and prevent, is an ancient practice. To continue the legacy we selected *Aloe barbadensis* extract to assess its lipid lowering effect on rat model. Here, it has been observed that Groups 5 and 6 showed statistically significant results ( $P < 0.05$ ) in the renal function test. Groups 4 and 5 exhibited significant levels of creatinine. When considering the SGPT and SGOT, it was seen that the SGOT levels in groups 5 and 6 were statistically significant ( $P < 0.05$ ). On the other hand, the SGOT levels were found to be significant in groups 6 and 7. In the instance of the lipid profile test, the outcome was found to be statistically significant ( $P < 0.05$ ) in groups 4, 5, and 6 for the total cholesterol level. In the case of triglyceride levels, however, there is no result that can be considered statistically significant. In the case of groups 5 and 6, the HDL level exhibited statistically significant ( $P < 0.05$ ) outcomes, but the LDL level showed statistically significant results in the case of group 6.

**Keywords:** *Aloe barbadensis*; SGPT; Herbal medicine; Triglyceride, phytopharmacology; cholesterol.

### **Introduction**

Among the human organs, the largest glandular organ, the liver, is responsible for the most functions. The whole blood supply of a person passes through the liver many times a day. Human metabolism relies heavily on the liver. [1]. The most common kind of liver disease, known as hepatotoxicity, is caused by medicines and ranks high among animal and human causes of mortality and disability. [2]. Liver cells are especially vulnerable to damage from things like drug and alcohol misuse, toxic chemicals, viral or parasite infections, and elevated levels of reactive oxygen species (ROS) ( $\text{OH}$ ,  $\text{H}_2\text{O}_2$ ,  $\text{O}_2$ ). [2]. People take ascorbic acid and the tripeptide L-glutathione (L-cysteine, glycine, and L-glutamate) orally as a dietary supplement because they can neutralize free radicals. Many people value them for their anti-oxidant,

cleaning, and immune-boosting properties. [3]. As an alternative, they might cause allergic reactions, including dermatitis, and gastrointestinal problems like bloating, diarrhea, stomach pains, and difficulty breathing owing to airway constriction. Chronic liver disease (CLD) affects 1.5 billion people globally; in the United States, the incidence has increased by 31% in the last several years among adults aged 45 to 64 years [4]. There may be therapeutic applications for some chemical components obtained from medicinal plants, according to experts in the field. Thus, scientists are continuously seeking out novel plant-based medicines, such as herbal remedies, to treat a broad variety of diseases [5]. Herbalism focuses on the practical use of therapeutic herbs, as opposed to phytotherapy, which is centered on scientific research. The vast variety of compounds found in plants, many of which have therapeutic properties, has made them an important part of human medicine for thousands of years [6]. Medicinal plants have a wide range of pharmacological and therapeutic effects due to the abundance of chemical components they contain. Some examples of these components include tannins, glycosides, alkaloids, saponins, polysaccharides, essential oils, terpenoids, resins, and plant lipids [7–9]. Plant genetic modification can achieve the targeted therapeutic impact by adjusting the amounts of chemical components. Improving the manufacture of secondary metabolites, such as alkaloids, is one use of reverse genetics [10].

One member of the Liliaceae family is the evergreen succulent Aloe vera (*A. barbadensis*). "Young lady" is the literal translation of Aloe vera's Sanskrit name, Kumari. Directing the flow of menstruation is a common use of aloe. It balances the monthly cycle-controlling Apana Vata, according to Ayurveda. Many more areas, including Mexico, nations around the Pacific Rim, South America, Central America, and the Caribbean. Its many medicinal and economic uses have led to its global cultivation. On a global scale, several species are farmed for significant economic gain. Indian states such as Rajasthan, Haryana, Punjab, Andhra Pradesh, Gujarat, Maharashtra, and Tamil Nadu are home to this species [11]. Polyphenol, glycoside, alkaloids, terpenoids, triterpenoids, phlobatannins, saponin, flavonoids, steroids, carbohydrate, and anthraquinone are all present [12, 13]. It has a wide range of pharmacological effects. Research has shown that this molecule has a variety of beneficial effects, including antibacterial, antidiabetic, cytotoxic, cardioprotective, bone protective, anti-inflammatory, skin protective, hepatoprotective, and neuroprotective properties [14, 15].

Our current research aims to assess *Aloe barbadensis*'s hepatoprotective effects.

## **MATERIALS AND METHODS**

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

*Aloe barbadensis* were collected from local market of Dhaka. The material was authenticated by the University of Dhaka's Department of Pharmacy. *Aloe barbadensis* was air-dried and severely crushed. The powder was then extracted for 15 days in 50% ethanol. The extract was filtered at three-day intervals. The extracted material 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**

Carbon tetrachloride (CCl<sub>4</sub>), a well-known hepatotoxicity causing chemical, was purchased from the Sigma firm in the United States. The typical anti-oxidant medication silymarin was purchased as Livasil 140 mg from Incepta Pharmaceuticals Ltd.

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

A total of 100 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±3°C, relative humidity 55±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).

### **Animal Model Sample Size Detection**

There were 100 rats in all, and they were randomly divided into ten groups of ten. In every study, the rats were randomly allocated to one of the groups. To make sure the study was genuine, we utilized 10 rats per group. Conversely, we watched the rat closely each day while it was mating. The study's control groups were both positive and negative.

### **Dose Selection and Route of Administration for Respective Study**

Carbon tetrachloride (CCL<sup>4</sup>) is a common chemical agent used in laboratories to study various liver diseases, both acute and chronic. Trichloromethyl free radical (CCL<sub>3</sub>), a CYP2E1 isozyme-produced CCL<sub>4</sub> metabolite, reacts with cellular lipids and proteins to form trichloromethylperoxy radical, which attacks lipids on the endoplasmic reticulum membrane faster than the trichloromethyl free radical, causing lipid peroxidation and lobular necrosis. A single oral treatment of CCL<sub>4</sub> mixed with olive oil as a vehicle in a 1:1 ratio (3 ml/kg of rat body weight) produced hepatic damage in all animal groups except the usual control group. *Aloe barbadensis* extracts were administered to animals with hepatic injury as a post-treatment. The extract was administered orally in various quantities.

### Evaluation of Hepato-Protective Activity

For this experiment, 100 rats were randomly picked and equally divided into ten groups

Table 1: 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	CCl <sub>4</sub> Control	N/A	N/A	A
3	CCl <sub>4</sub> + S <sub>10</sub>	Silymarin	10	S <sub>10</sub>
4	CCl <sub>4</sub> + AB <sub>200</sub>	<i>Aloe barbadensis</i>	200	AB <sub>200</sub>
5	CCl <sub>4</sub> + AB <sub>400</sub>	<i>Aloe barbadensis</i>	400	AB <sub>400</sub>
6	CCl <sub>4</sub> + AB <sub>600</sub>	<i>Aloe barbadensis</i>	600	AB <sub>600</sub>
7	S <sub>10</sub>	Silymarin	10	S <sub>10</sub>
8	AB <sub>200</sub>	<i>Aloe barbadensis</i>	200	AB <sub>200</sub>
9	AB <sub>400</sub>	<i>Aloe barbadensis</i>	400	AB <sub>400</sub>
10	AB <sub>600</sub>	<i>Aloe barbadensis</i>	600	AB <sub>600</sub>



<b>1</b>	Negative Control	0.5±0.04	26.52 ±3.41	35.24 ±0.82	35.24±0 .82	96.32±4. 19	45.35±2.63	38.25±3. 91	69.26±4.3 3
<b>2</b>	CCl <sub>4</sub> Control	2.8±0.07	94.59 ±5.52	104.5 9±3.9 1	98.24±5 .27	152.49± 6.22	106.79±5.58	89.57±3. 20	43.46±2.3 9
<b>3</b>	CCl <sub>4</sub> + S <sub>10</sub>	1.4±0.06	42.63 ±4.53	72.72 ±3.29	70.29±4 .19	109.42± 5.82	58.67±4.23	60.54±4. 11	57.49±3.2 4
<b>4</b>	CCl <sub>4</sub> + AB <sub>200</sub>	2.3±0.05*	91.69 ±4.50	100.4 2±2.6 8	96.59±4 .80	141.39± 6.49*	102.31±3.17	89.19±4. 53	46.48±1.2 6
<b>5</b>	CCl <sub>4</sub> + AB <sub>400</sub>	1.9±0.05*	87.23 ±4.39 *	96.58 ±4.79 *	92.51±3 .24*	137.25± 3.26*	96.56±4,91	87.39±3. 18	50.24±2.4 9*
<b>6</b>	CCl <sub>4</sub> +A B <sub>600</sub>	1.6±0.07	84.25 ±5.26 *	91.79 ±2.29 *	88.57±2 .08*	132.55± 4.50*	90.23±2.87	84.61±3. 22*	53.19±3.1 6*
<b>7</b>	S <sub>10</sub>	0.7±0.01	27.30 ±4.19	44.39 ±2.45	36.28±1 .83	97.20±5. 40	42.66±1.92	39.91±4. 02	69.17±3.1 9
<b>8</b>	AB <sub>200</sub>	0.6±0.02	28.24 ±3.14	42.43 ±3.39	38.91±2 .53	93.28±4. 50	44.05±0.87	42.45±2. 39	71.26±2.1 8
<b>9</b>	AB <sub>400</sub>	0.09±0.07	30.26 ±0.89	45.39 ±2.93	34.91±3 .29	100.59± 3.26	46.29±1.56	35.63±1. 92	72.40±3.1 9
<b>10</b>	AB <sub>600</sub>	0.08±0.03	26.82 ±1.57	44.50 ±1.26	34.56±2 .21	96.59±2. 49	44.18±2.36	40.49±2. 37	68.46±2.2 0

**Note:** Each value represents the mean ± SEM. (n=5). One- way ANOVA followed byDunnett's t test. \*\*\*P<0.001,

\*\*P<0.01, \*P<0.05 compared with control.

Both end-stage renal disease (ESRD) and severe chronic kidney disease (CKD) are medical conditions that may lead to cognitive impairment. The link between chronic kidney disease (CKD) and cognitive impairment is a significant problem that the public health community must address [16]. The prevalence of chronic kidney disease (CKD) in the United States went from 10% in the years 1988–1994, to 13% in the years 1999–2004, and it is possible that this trend may continue in the years to come. There was a statistically significant difference in the levels of creatinine between groups 4 and 5, whereas the findings of the kidney function test were statistically significant between groups 5 and 6. There were many studies that came up with the same results [17, 18]. There was a statistically significant relationship between the SGPT and SGOT levels; however, only the SGOT levels were significant for groups 6 and 7, in comparison to the SGPT levels. The findings of several studies [19–21] were consistent with one another. According to the findings of the lipid panel test, groups 4, 5, and 6 exhibited values that were statistically significant for total cholesterol levels. On the other hand, when it comes to triglyceride levels, there is no statistically significant influence of this kind. Researchers found statistically significant levels of HDL in groups 5 and 6, while case 6 showed statistically significant levels of LDL. In a number of studies [22–24], researchers came to the same results.

### **Conclusion:**

The results of this experiment revealed that the ethanolic extract of *Aloe barbadensis* had hepatoprotective effects. The hepatoprotective effects of the ethanolic extract of *Aloe barbadensis* were determined over the course of the experiment. By lowering the buildup of lipids and liver problems, this extract helps to reduce the negative effects that a diet high in fat may have on the body. In order to determine which component of the entire extract really provides the anti-hyperlipidemic action through a screening approach, more research is necessary.

### **Ethical Approval**

Animal Ethic committee approval has been collected and preserved by the author(s)

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