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Research Article

Effects of *Abelmoschus esculentus* pod extract on hyperlipidemia in humans

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Abstract

Nowadays, hyperlipidaemia is one of the major problems prevailing among humans, indicating increased blood lipids content like LDL, HDL, VLDL, Cholesterol, and serum triglyceride. LDL (Low-Density Lipid) is one of the five major groups of lipoproteins, which transport all fat molecules around the body in extracellular fluid. LDL is not considered good for the body as it can cause atherosclerosis, if, oxidized in the wall of the artery. HDL (High- Density Lipid) is also a lipoprotein, which is considered as good fat as it transports fat from the body within the water around cells. Serum triglyceride is a type of fat in the blood. High triglyceride in the blood may be responsible for coronary artery disease especially in human females. Moreover, increased lipid content in human blood can raise the risk of many heart diseases, including heart attack. The pharmacological effects of many plants like *Abelmoschus esculentus* attribute to various constituents like mucilage, tannins, terpenoids, flavonoids, and glycosides, present in all plant parts. The report suggests that okra mucilage, okra pectin, and okra fibres combat with heart diseases as it binds to cholesterol and bile acids, which carry toxins and dump it in the liver (Gemede, 2015).

The present study was carried out to find out the efficacy of *Abelmoschus esculentus* aqueous extract to reduce Serum Triglyceride, Serum Cholesterol, HDL Cholesterol, VLDL Cholesterol, CHOL/HDL Cholesterol Ratio in the Human blood.

Initially, the blood samples were collected prior to the administration of plant extract. Further, blood samples were taken after the 7th day, 14th day, 21st day, and 28th day of administration of whole plant extract. The blood samples were centrifuged for separating blood serum from the blood. The blood serum of each sample was analysed for lipid profile by using a fully automatic access Robertic biochemistry Analyzer (Response-90) by Diasys Company of Germany.

From the current study, it can be concluded that oral ingestion of the pod extract of *A. esculentus* has the potential to reduce lipid content in human blood, including serum triglyceride, serum cholesterol, HDL, VLDL, LDL, and CHOL/HDL Cholesterol ratio.

Keywords: *Abelmoschus esculentus, lipid profile, LDL, HDL, VLDL, cholesterol and serum triglyceride, robertic biochemistry analyzer.*

OBJECTIVES OF THE STUDY

The current study is aimed to find the ability of *Abelmoschus esculentus* pod extract to reduce Serum Triglyceride, Serum Cholesterol, HDL Cholesterol, VLDL Cholesterol, CHOL/HDL Cholesterol Ratio of the Human blood.

INTRODUCTION

Hyperlipidaemia is one of the major problems prevailing among humans today in which there is increased blood lipids content including LDL, HDL, VLDL, Cholesterol, and serum triglyceride. LDL (Low-Density Lipid) is one of the

five major groups of lipoproteins, which transport all fat molecules around the body in extracellular fluid. LDL is not considered good for the body as it can cause atherosclerosis if oxidized in the wall of the artery. HDL (High-Density Lipid) is also a lipoprotein that transports fat from the body within the water around cells. Serum triglyceride is a type of fat in the blood. High triglyceride in the blood may be responsible for coronary artery disease especially in human females. Increased lipid content in human blood can raise the risk of many heart diseases including heart attack. In the current study, an effort is being done to combat hyperlipidaemia in human blood by using pod extract of *Abelmoschus esculentus* (Oyelade et al., 2003).

The pods of *Abelmoschus esculentus* are chiefly consumed as vegetables worldwide but they are also used for medicinal purposes due to their anti-hyperlipidaemic, anti-diabetic and anti-oxidant properties. The pharmacological effects of *Abelmoschus esculentus* can be attributed to constituents like tannins, terpenoids, flavonoids, and glycosides, which are present in all parts of the plant (*Nargis sultana* et al. 2019*)* 1. Okra mucilage, okra pectin, and okra fibres combat heart diseases as they bind to cholesterol and bile acids and dump them in the liver (*Gemede HF* 2015) 3.

Work Site D.B.S (P.G) College Dehradun, Tyagi Diagnostic Lab Roorkee.

REVIEW OF LITERATURE

Nargis Sultana Chowdhury in the year 2019 studied the Ethnomedicinal, Pharmacological, Phytochemical, and Pharmaceutical Profile of Lady's Finger *Abelmoschus esculentus* (L)**.** Esam et al. in the year 2017 studied the Antihyperlipidemic and Glucose Lowering Effect of Extract of Bioregulator Treated Okra (*Abelmoschus esculentus* L.) Fruits in Triton-Induced Hyperlipidaemia Rats. In 2015 Gemede HF et al. studied the nutritional quality and health benefits of Okra and found that Okra mucilage, okra pectin, and okra fibres combat with heart diseases as it binds to cholesterol and bile acids which carry toxins and dump it in the liver. In the year 2013 Sathish, Eswar worked on *Abelmoschus esculentus.* Sengkhamparn et al. (2009) worked on the Characterisation of cell wall polysaccharides from okra (*Abelmoschus esculentus* (L.). *Arapitsas* (2008) Identified and quantified polyphenolic compounds from okra seeds and skins. Calisir S, Yildiz MU in 2005 studied some Physio-chemical properties of *Hibiscus esculenta* seeds. Kendall and Jenkins (2004) studied the maximal reduction of low-density lipoprotein cholesterol with diet.

MATERIALS AND METHODS

Abelmoschus esculentus (L) is a perennial herb (grown as an annual crop in temperate zones) that belongs to the family Malvaceae and is classified within the genus of about fifteen species. The plant is popularly known as Lady's Finger Okra/ gumbo. The plant is cultivated in tropical, subtropical, and warm temperate regions of the world and distributed from Africa to Asia, Europe, and America, etc. *Abelmoschus* attains a height of about 6.6 feet with 10cm-20cm long leaves, which are orbicular, palmate, and petiolate. Flowers are axillary and solitary and yellow in colour. The green pod (fruit) is 10-25cm long, which is generally used as vegetable food due to its nutritional value. Fruit matures in 3 to 5 months. The plant grows well in moist soil under sunny conditions and cannot grow in shad shown in Figures 1a, 1b & 1c.

Fully automatic access Robertic biochemistry Analyzer (Response-90) by Diasys Company of Germany was used for lipid profile analysis. Blood samples were centrifuged to separate serum from the blood sample shown in Figure 2a & 2b.

Plant Pod extract was prepared on daily basis by longitudinally cutting the pods of *A. esculentus*, the pods were then placed in clean water in a beaker and left overnight. The constituents of pods were collected in water. 500 ml plant pod extract was ingested in raw state daily and the pod remains were eaten directly shown in Figure 3a, b & c.

Lipid profile tests were conducted using blood serum. Initial control blood sample was taken without ingestion of the plant extract; further blood samples were taken after ingestion of plant pod extract of *A. esculentus* for 28 days. Readings were recorded for lipid profile at 7th day, 14th day, 21st day and 28th day after regularly ingesting plant extract. Readings were recorded for serum triglyceride, serum cholesterol, HDL, VLDL, LDL, CHOL/HDL Cholesterol ratio for each blood sample shown in Figure 4a & 4b.

Figure 1a. Twig of *A. esculentus.*

Figure 1b. Flower of *A. esculentus.*

Figure 1c. Pod of *A. esculentus.*

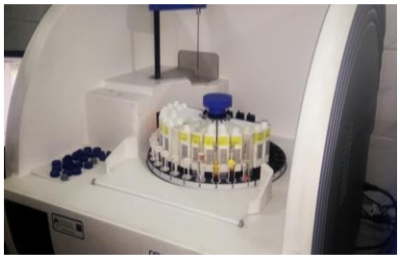

Figure 2a. Robertic biochemistry Analyzer.

Figure 2b. Centrifuge.

Figure 3a. Pods of *A. esculentus.*

Figure 3b. Pods of *A. esculentus* in water.

Figure 3c. Pod extract of *A. esculentus.*

Figure 4a. Blood Sample.

Figure 4b. Robertic biochemistry Analyzer.

RESULTS AND DISCUSSION

The blood sample 1 and II was analysed for lipid profile i.e. Serum Triglyceride, Serum Cholesterol, HDL Cholesterol, VLDL Cholesterol, LDL Cholesterol, CHOL/HDL Cholesterol Ratio. The control readings were taken without drinking pod extract while further readings were recorded on the 7th day, 14th day, 21st day, and 28th day after ingesting pod extract on daily basis (Sorapong, 2012).

The readings of blood sample I, Serum triglyceride are 137 mg/dl, 98.49mg/dl, 89.50mg/dl, 85.24mg/dl, mg/dl and 79.98mg/dl. Serum Cholesterol readings are 186.0 mg/dl, 174.75 mg/dl, 169.21 mg/dl, 163.18 mg/dl, and 159.67mg/dl. The values for HDL Cholesterol were 53.4mg/dl, 44.32mg/dl, 41.13mg/dl, 39.24mg/dl, and 32.16 mg/dl. The readings of VLDL Cholesterol are 27.40 mg/dl, 25.25 mg/dl, 23.18mg/dl, 21.22 mg/dl, mg/dl and 20.19mg/dl. LDL Cholesterol readings are 105.20 mg/dl, 126.74mg/dl, 110.14 mg/dl, 104.27 mg/dl, and 99.64 mg/dl. The values for CHOL/HDL Cholesterol were 3.48 mg/dl, 2.86 mg/dl, 2.74 mg/dl, 2.64 mg/dl, and 2.56 mg/dl. There was a general decrease in the values of all the lipid parameters of the human blood after taking the pod extract of *A. esculentus.* Shown in Table 1 and Figure 5a & 5b.

The readings of blood sample II, Serum triglyceride are 149.0 mg/dl, 136.43 mg/dl, 121.38 mg/dl, 93.16 mg/dl, mg/dl and 72.67mg/dl. Serum Cholesterol readings are 192.0 mg/dl,

Table 1. Biochemistry of Blood Samples I (mg/DL).

S/No	Lipid Profile	Control	7th day	14th day	21st day	28th day
1	Serum Triglyceride	137.0	98.49	89.50	85.24	79.98
2	Serum Cholesterol	186.0	174.75	169.21	163.18	159.67
3	HDL Cholesterol	53.4	44.32	41.13	39.24	32.16
4	VLDL Cholesterol	27.40	25.25	23.18	21.22	20.19
5	LDL Cholesterol	135.25	126.74	110.14	104.27	99.64
6	CHOL/HDL Cholesterol	3.48	2.86	2.74	2.64	2.56

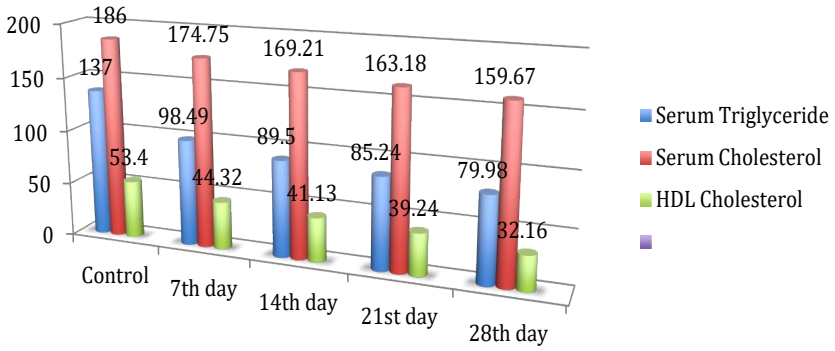

Figure 5a. Graph for serum triglyceride, cholesterol, HDL Cholesterol.

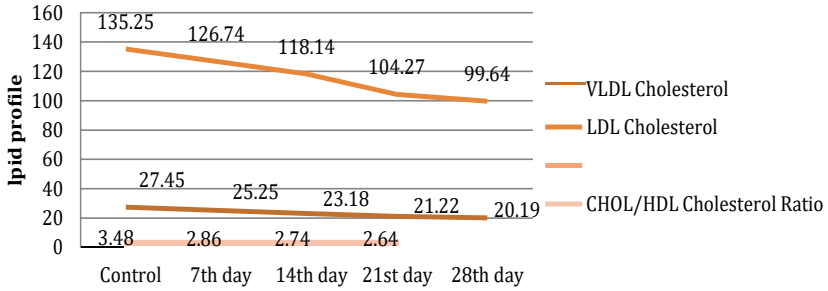

Figure 5b. Graph for VLDL Cholesterol, LDL Cholesterol, CHOL/HDL Cholesterol Ratio.

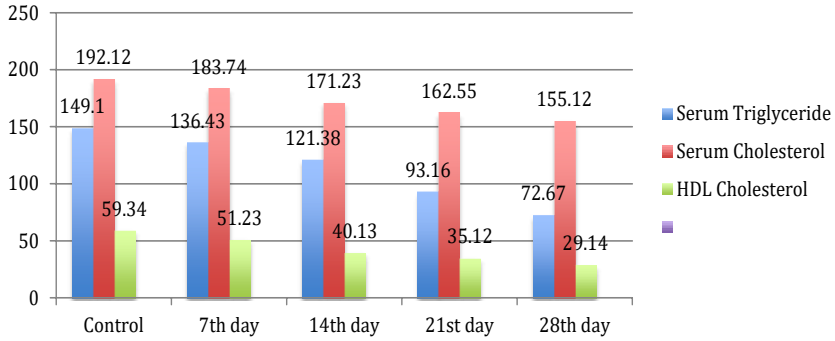

Figure 6a. Graph for serum triglyceride, cholesterol, HDL Cholesterol.

183.74 mg/dl, 171.23 mg/dl, 162.55 mg/dl, and 155.12 mg/dl. The values for HDL Cholesterol were 59.3 mg/dl, 51.23 mg/dl, 40.13 mg/dl, 35.12 mg/dl, and 29.14 mg/dl. The readings of VLDL Cholesterol are 31.24 mg/dl, 27.45 mg/dl, 25.15 mg/dl, 23.14 mg/dl, and 20.03 mg/dl. LDL Cholesterol readings are 110.23 mg/dl, 102.16 mg/dl, 99.45 mg/dl, 92.87 mg/dl, and 89.45 mg/dl. The values for CHOL/HDL Cholesterol were 3.29 mg/dl, 2.67 mg/dl, 2.45 mg/dl, 2.33 mg/dl, and 2.13 mg/dl. There was general decrease in the values of all the lipid parameters of the human blood after taking pod extract of *A. esculentus* shown in Table 2 and Figure 6a & 6b (Nargis et al., 2019; Gemede, 2015).

Table 2. Biochemistry of Blood Samples II (mg/DL).

S/N o	Lipid Profile	Control	7th day	14th day	21st day	28th day
1	Serum Triglyceride	149.10	136.43	121.38	93.16	72.67
2	Serum Cholesterol	192.12	183.74	171.23	162.55	155.12
3	HDL Cholesterol	59.34	51.23	40.13	35.12	29.14
4	VLDL Cholesterol	31.24	27.45	25.15	23.14	20.03
5	LDL Cholesterol	110.23	102.16	99.45	92.87	89.45
6	CHOL/HDL Cholesterol Ratio	3.39	2.67	2.45	2.33	2.13

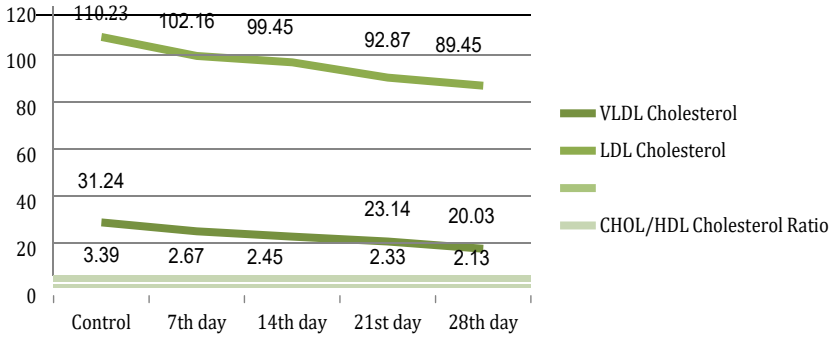

Figure 6b. Graph for VLDL Cholesterol, LDL Cholesterol, CHOL/HDLCholesterol Ratio.

CONCLUSION

From the current study, it can be concluded that oral ingestion of pod extract of *Abelmoschus esculentus* can reduce the lipid content of human blood including serum triglyceride, serum cholesterol, HDL, VLDL, LDL, CHOL/ HDL Cholesterol ratio. The pharmacological effects of *Abelmoschus esculentus* can be attributed to constituents like tannins, terpenoids, flavonoids, and glycosides, which are present in all parts of the plant. Okra mucilage, okra pectin, and okra fibres combat with heart diseases as it binds to cholesterol and bile acids which carry toxins and dump it in the liver.

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