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Research Paper

# Hypolipidemic Activity of Bryonia Scabrella (Linn) Leaves in Mice Fed With High Fat Diet

Biochemistry

**KEYWORDS :** Hyperlipidemia, Bryonia scabrella , High fat diet, LDL, HDL.

**S. VELVIZHI** — Assistant Professor in Biochemistry, Biotechnology and Bioinformatics Avinashilingam Institute for Home Science and Higher Education for Women Combatore-641043.

**M.VIJIPRIYA** — Research Scholar, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore-641043

## ABSTRACT

*Hyperlipidemia has been ranked as one of the greatest risk factors contributing to prevalence and severity of coronary heart diseases. It is characterized by elevated level of triglycerides (TG), cholesterol, low-density lipoprotein (LDL), very low -density lipoprotein (VLDL) and decreased high-density lipoprotein (HDL) in the blood. The present study was aimed to evaluate the hypolipidemic activity of the aqueous extract of Bryonia scabrella (Linn) leaves. Hyperlipidemia was induced by mice fed with high fat diet. The mice fed with high fat diet for 30 days (one month) exhibited significant($p<0.001$) increase in TC, TG, LDL-C and VLDL and decrease in HDL-C as compared to normal diet control. Treatment with aqueous extract of Bryonia scabrella (100mg/kg body weight) showed significant decrease in elevated TC, TG, LDL-C, and VLDL, with significant increase in HDL-C as compared to high cholesterol diet control. Based on these investigations, it was concluded that the leaves of Bryonia scabrella (Linn) leaves posses marked anti hyperlipidemic activity.*

**Introduction**

The long-term hyperlipidemia is an important contributor to develop the progression of micro and macro vascular complications including microangiopathy and cardiovascular diseases. The prevalence of hyperlipidemia dramatically increases with the consumption of high-fat diet. The consumption of synthetic drugs leads to hyperuricemia, diarrhoea, nausea, myositis, gastric irritation, flushing, dry skin and abnormal liver function. Medicinal plants are used for various research purposes. It has been reported that traditional systems have immune potential against various diseases. Consumption of medicinal plant extracts and their ingredients could be a more effective strategy for management of hyperlipidemia (Sundarrajan *et al.,* 2010).

*Bryonia scabrella (Linn.f.*) (Locally known as Musumusukkai in Tamil) ( family *: Cucurbitaceae*), is an annual monoecious, climbing vine or prostrate herb , densely covered with white hairs and found commonly in waste places and vacant fields throughout India and in China , Taiwan , Malaysia , Australia, new Zealand , and in Africa (Chatterjee and pakrashi.,2000). The leaves of *Bryonia scabrella* find a prominent place in the siddha and ayurvedic systems of medicine for over three centuries. The leaves and tender shoots are useful as aperients, diuretic, stomachic, antipyretic, anti flatulent, antiasthmatic, antitussive, antihistaminic, antibronchitic, and as an expectorant, in addition to its prescription against vertigo and biliousness (Loganathan.,2007). The extract of the leaves and bark is reported to be a good decongestant and a very good remedy for cough , cold , and flu (Prakash Rao .,2007).

The present study was designed to investigatethe hypolipidemic activity of aqueous extract of leaves of *Bryonia scabrella*t in albino mice an attempt to establish traditional use of this plant.

**Materials and Methods**

**Collection of Plant material**

The leaves of *Bryonia scabrella* was collected from Ramanathapuram district (keelakottai village, paramakudi town). A voucher specimen has been identified by the Tamilnadu Agricultural University (TNAU) at Coimbatore for future reference. The leaves were cleaned, air dried and powdered. The powdered leaves were used in this experiment.

**Preparation of *Bryonia scabrella* leaves Extract:**

The shade dried *Bryonia scabrella* leaves were coarsely powdered and extracted with aqueous using sox let apparatus. The aqueous extract was evaporated under reduced pressure and the yields were collected. The residue obtained was kept in dry clean bottle used.

**Selection and Grouping of animals**

Healthy albino female mice of Wister strain weighing between 20-25gm were selected for the experiment. The mice were purchased from the breeding station , Thrisur in Kerala and were acclimatized to the laboratory conditions (12+ /hr, day and night schedule , temperature maintained between 11- 20'C + 2'C; housed in large hygienic plastic cages). The institutional guide for use and care of laboratory animals was followed throughout the study. Before a week of the experiment, water and natural pellets were provided throughout the experimental period.

**Preparation of animal's diet:**

The compositions of the two diets were as follows;

**1. Control diet:**

Commercially available normal pellet diets were used for normal group and plant extract group done.

**2. High fat diet:**

The composition of high-fat diet contains milk powder(10%), wheat flour (61%), sugar(5%), butter(16%), salts(4%), vitamins(2%), Fibers(1%), and coconut oil(1%) were induced for cholesterol control and cholesterol diet with plant treated groups.( Dhandapani *et al.*,2007)

**Group** 1 – Normal (commercially available natural pellet diet)

**Group** 2 – High Cholesterol diet control

**Group** 3 – Aqueous extract (natural pellet diet with 100mg/kg b.wt)

**Group** 4 – High Cholesterol diet treated aqueous extract (100mg/kg b.wt)

Treatment was given daily for 30 days orally.

Before treatment, the Mice were fasted overnight with free access to water. On the 30th day of study, the animals were sacrificed and the samples of blood, liver and heart were collected from each animal to produce biochemical assay (Ray et al.,

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2006).

**Sample collection for biochemical assay**

The organs like heart, liver and the blood samples from each animal were isolated, collected and stored. A part of the organs were washed with ice cold PBS, blotted dry and homogenate well prepared using phosphate buffered saline (PH 7.2). The biochemical parameter considered were Total cholesterol (TC), High density lipoprotein (HDL), Low density lipoprotein (LDL), very low density lipoprotein (VLDL) and Triglycerides (TG).

**Results and Discussion**

**Table 1: EFFECT OF *BRYONIA SCABRELLA* LEAF EXTRACT ON SERUM LIPID PROFILE IN HYPERLIPIDEMIC MICE**

| | TC(mg/dl) | TG(mg/dl) | HDL-C(mg/dl) | LDL-C(mg/dl) | VLDL(mg/dl) |
|---|---|---|---|---|---|
| Normal control | 128.373±0.005 | 98.367±0.231 | 34.470±0.017 | 86.067±0.115 | 27.667±0.057 |
| High choles diet control | 167.113±0.02 | 132.367±0.153 | 10.333±0.01 | 134.233±0.057 | 42.700±0.200 |
| High cholesd diet+ plant extract | 132.097±0.075 | 103.993±0.011 | 20.400±0.346 | 98.567±0.115 | 30.667±0.153 |
| Plant extract | 124.273±0.0115 | 88.167±0.289 | 38.143±0.0115 | 90.567±0.0577 | 24.633±0.0577 |

**Values are expressed by mean ± standard deviation of triplicates There is statistically significant difference (p= <0 .001).**

The mice fed with high cholesterol diet for 30 days (one month) exhibited significant($p<0.001$) increase in serum TC, TG, LDL-C and VLDL and decrease in HDL-C as compared to normal diet control. Treatment with aqueous extract of *Bryonia scabrella* (100mg/kg body weight) showed significant decrease in elevated TC, TG, LDL-C, and VLDL, with significant increase in HDL-C as compared to high cholesterol diet control.

This lipid lowering effect may be due to the inhibition of hepatic cholesterogenesis or due to the increase in excretion of fecal sterol (Purohit and Vyas.,2006). Plant sterols are also reported to decrease cholesterol absorption and they compete with dietary and biliary cholesterol for incorporation into mixed miscelles in the intestinal lumen thus inhibiting their uptake (Brufau *et al.*, 2008).

**Liver lipid profile:**

**Table 2: EFFECT OF *BRYONIA SCABRELLA* LEAF EXTRACT ON LIVER LIPID PROFILE IN HYPERLIPIDEMIC MICE**

| | TC(mg/dl) | TG(mg/dl) | HDL-C(mg/dl) | LDL-C(mg/dl) | VLDL(mg/dl) |
|---|---|---|---|---|---|
| Normal control | 105.467±0.05 | 58.833±0.0173 | 66.600±0.000 | 98.166±0.057 | 11.553±0.15 |
| High cholesterol diet control | 148.220±0.01 | 115.100±0.173 | 26.333±0.289 | 160.613±0.01 | 46.000±1.00 |
| High cholesterol diet + plant extract | 126.473±0.01 | 73.600±0.173 | 46.653±0.0057 | 120.713±0.02 | 21.387±0.19 |
| Plant extract | 120.0±0.017 | 66.357±0.0057 | 57.550±0.017 | 87.233±0.058 | 16.387±0.15 |

**Values are expressed by mean ± standard deviation of triplicates There is statistically significant difference (p= <0.001).**

The sequential changes in liver TC, TG, LDL-C, VLDL and HDL-C, were summarized in table 2. High cholesterol diet fed mice for 30 days(one month), significantly increase the level of liver TC, LDL-C, VLDL and TG with less concentration of HDL-C compared to normal control. Treatment with aqueous leaf extract of *Bryonia scabrella* (100mg/kg body weight) showed significant decrease in elevated TC, TG, LDL-C and VLDL, with significant increase in HDL-C ($p<0.001$) as compared to high cholesterol diet control. The plant extract with normal pellet diet (100mg/kg body weight) showed significant decrease in elevated TC, TG, LDL-C and VLDL, with significant increase in HDL-C as compared to normal diet control ($p<0.001$).

The result demonstrated that the cholesterol administration significantly increased the concentration of the hepatic TC and TG levels in mice, which indicated that dietary cholesterol obviously disturbed the hepatic lipid metabolism.By treatment with aqueous extract of plant, the hepatic TG level is controlled mainly by its synthesis, beta-oxidation and secretion in form of lipoprotein (Davis *et al.*, 1982). The decrease in cholesterol may indicate increased oxidation of mobilized fatty acids of inhibition or lipolysis. Thomas *et al,* has reported that the hepatic TG accumulation by high dietary cholesterol was involved in the stimulation of fatty acid and TG synthesis in rats.

Flavonoids in *Bryonia scabrella* leaves may act by making liver cells more efficient to remove LDL-C from blood. Flavonoids increase LDL receptor densities in liver and by binding to apolipoprotein.(Abdul hameed thayyil *et al.*, 2011). The above evidence strongly support that the *Bryonia scabrella* leaves act as antihyperlipidemic agent.

**Heart lipid profile:**

The lipid profile in heart from the experimental groups is seen in the table 3.

**Table 3: EFFECT OF *BRYONIA SCABRELLA* LEAF EXTRACT ON HEART LIPID PROFILE IN HYPERLIPIDEMIC MICE**

| | TC | TG | HDL-C | LDL-C | VLDL |
|---|---|---|---|---|---|
| Normal control | 107.467±0.404 | 82.333±0.028 | 53.827±0.011 | 63.820±0.0173 | 16.507±0.0321 |
| High cholesterol diet control | 147.223±0.00577 | 144.733±0.02 | 35.250±0.043 | 86.667±0.05 | 32.747±0.22 |
| High cholesterol diet + plant extract | 93.557±0.491 | 119.467±0.0577 | 42.167±0.577 | 67.167±0.11 | 25.433±0.35 |
| Plant extract | 80.753±0.00577 | 108.340±0.0173 | 63.753±0.00577 | 50.633±0.11 | 11.367±0.20 |

**Values are expressed by mean ± standard deviation of triplicates There is statistically significant difference (p= <0.001).**

Table 3 demonstrate the lipid profile levels in heart tissue. Similar pattern was observed in heart tissue also. This high cholesterol concentration in circulation may damage the endothelial cell lining in the large arteries and aorta and this may be an initial event in the eitiology of atherosclerosis. By treating with *Bryonia scabrella* containing phytoconstituent of high saponin is also suggested to reduce heart disease.

The aqueous extract of leaves of *Bryonia scabrella* induced an increase in serum HDL-C level in the hyperlipidemic model. During blood circulation, HDL-C mediates the transfer of excess cholesterol from the peripheral cells to the liver for its ca-

tabolism by a pathway termed as "reverse cholesterol transport" hence increased serum HDL-C levels may prove beneficial in lipid disorders and might also served as a cardioprotective factor to prevent gradual initiation of atherosclerotic process. (Khyati *et al.,* 2010).

**Conclusion**

Finally, on the basis of the above results it can be concluded that the leaf extract of *Bryonia scabrella* showed significant potential to lower the level of plasma lipid profile followed by a beneficial effect on HDL and its ratio with total cholesterol in hyperlipidemic mice model, may further be optimized for development of anti hyperlipidemic drug.

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