

Lack of anti-obesity effect of *Mimosa pudica* seed mucilage on mice fed on a high-fat diet

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Abstract

Objective: To investigate the anti-obesity potential of the mucilage of the *Mimosa pudica* Linn. seed on mice fed on a high-fat diet. **Materials and Methods:** Two *in vivo*, that is, lipid emulsion and high-fat diet models were used to investigate the anti-obesity effect in male Swiss albino mice. In the high-fat diet model, the mice were fed a high-fat diet, containing 60% fat, with or without mucilage, for six weeks. The time course of body weight, food intake, organ and fat pad weight (liver and parametrial fat), and serum parameters (triglyceride, total cholesterol, etc.) were measured. In the other model, lipid emulsion with or without mucilage was administered orally, and the plasma triacylglycerol level was measured at 0 to 5 hours. **Results:** No significant reduction in body weight, organ or fat pad weight (liver and parametrial fat) or serum parameters (triglyceride, total cholesterol) after treatment with mucilage in high-fat diet fed mice was observed. Furthermore the mucilage did not inhibit the elevation of the plasma triacylglycerol level at five hours after the oral administration of lipid emulsion. **Conclusion:** The present study indicated that the mucilage of the *Mimosa pudica* seed did not reveal significant anti-obesity action in high-fat diet fed mice.

Key words: Anti-obesity activity, mucilage, *Mimosa pudica*, sensitive plant

INTRODUCTION

Obesity, defined as the excessive accumulation of body fat that may impair health, has become a worldwide epidemic.^[1] Obesity is related to increased risks of coronary heart diseases, hypertension, non-insulin-dependent diabetes mellitus, and certain types of cancer.^[2-4] The major factor contributing to obesity is the imbalance between energy intake and expenditure.^[5] In view of the wide occurrence of obesity, a great demand exists for the development of new anti-obesity drugs through herbal sources, to minimize the side-effects associated

with the present synthetic anti-obesity drugs. The anti-obesity activity of mucilage has been proven clinically.^[6,7] It has been proposed that the mucilage may lead to gel formation in the stomach, resulting in a sustained feeling of satiety or prevention of increase in appetite or hunger. The lowered energy intake and increased satiety feeling may be beneficial for short-term weight loss and long-term weight maintenance.^[7]

Mimosa pudica Linn. (Mimosaceae) commonly known as the 'sensitive plant' is a diffuse under shrub. It is native to America, but has naturalized throughout India.^[8] The plant is well-known for its medicinal properties, particularly for the treatment of piles.^[9] It has been traditionally used in the treatment of various ailments including alopecia, diarrhea, dysentery, insomnia, tumor, and various urogenital infections.^[10] The seeds contain mucilage, which is composed of d-xylose and d-glucuronic acid, and swell rapidly on coming in contact with water.^[11] It is possible that the mucilage possesses anti-obesity activity, by reducing the appetite and increasing a feeling of satiety,

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thus limiting caloric intake. Therefore, this study is designed to investigate the anti-obesity potential of the *Mimosa pudica* seed mucilage.

MATERIALS AND METHODS

Collection of seeds

The seeds of *Mimosa pudica* Linn were purchased from the local market of Hisar. The seeds were taxonomically identified and authenticated by Dr. H.B. Singh, Head, Raw Materials Herbarium and Museum Division of the National Institute of Science, Communication, and Information Resources. The voucher specimen has been deposited in the herbarium section of the Pharmacognosy Division, Department of Pharmaceutical Sciences, Guru Jambheshwar University of Science and Technology, Hisar, for further reference.

Extraction of mucilage

Mimosa pudica seeds were soaked in a sufficient quantity of water for 10 hours; the hydrated mucilage along with the seeds were spread in a thin layer on a stainless steel tray and dried in the oven at 50°C for four to five hours. The dried mucilage was scraped from the tray by a blade and separated from the seeds by passing through a No. 18 mesh. It was then further purified by winnowing, to separate the seed husk.^[12]

Animals

Male Swiss albino mice (five weeks old) were used for the *in vivo* models. The animals were housed for one week under a 12 hour / 12 hour light / dark cycle in a temperature and humidity controlled room. The animals were given free access to food and water. After adaptation to the lighting conditions for one week, the healthy animals were used in *in vivo* models. The experimental protocols were approved by the Institutional Animal Ethical Committee, Guru Jambheshwar University of Science and Technology, Hisar (Regn No 0436).

Plasma triacylglycerol level after oral administration of lipid emulsion to mice

The animals were divided in two groups and deprived of food overnight. The test group was orally administered lipid emulsion (5 ml / kg) with mucilage (900 mg / kg). The positive control group was given only lipid emulsion. The oil emulsion was prepared with 7 ml of olive oil, 93 mg of cholic acid, and 7 ml of deionized water. Food was withheld during the test. Blood samples were collected from the ophthalmic venous plexus at 0, 1, 2, 3, 4, and 5 hours using a heparinized capillary tube, and centrifuged at 6300 rpm for 10 minutes. The plasma triglyceride levels were measured using a commercial triglyceride assay kit.

High-fat diet-induced obesity

Male Swiss albino mice (five weeks old) were acclimatized for one week, fed a high-fat diet (HFD) for two weeks, and randomly divided into three groups matched for body weight. Each group contained ten animals. The control group was fed a normal diet *ad libitum*. The test group received mucilage (900 mg / kg) and a high-fat diet. The positive control group received a high-fat diet. The treatment was carried out for six weeks. The composition of the high-fat diet was as follows (g / 100 g food): corn starch, 10; sugar, 10; Lard, 40; Vitamin mixture, 1; mineral mixture, 4; casein, 20; cellulose, 5; soybean oil, 7; and methionine, 3. The total food intake by each group was recorded at least twice a week, and the body weight of each mouse was recorded once a week. At the end of the experiment, the blood was taken by venous puncture, under anesthesia, with diethyl ether, and the mice were then killed with an overdose of diethyl ether. The experiments were performed in a ventilated room. The serum was prepared and frozen at - 80°C, until analysis. The liver and parametrial adipose tissue were dissected and weighed. The plasma triglyceride (TG), total cholesterol (TC), HDL-cholesterol, and VLDL-cholesterol were measured using the Triglyceride E-Test and Total Cholesterol E-Test kits.

Statistical analysis

The data were expressed as the mean \pm SEM. Comparisons among the groups of data were carried out using the one-way ANOVA followed by the Dunnett's t-test.

RESULTS AND DISCUSSION

Effect of *Mimosa pudica* seed mucilage on the plasma triacylglycerol level after orally administering lipid emulsion to mice

Figure 1 shows the time-course characteristics of the plasma triacylglycerol concentration when an olive oil emulsion with or without mucilage was orally administered to mice. At 2, 3, 4, and 5 hours after orally administering the lipid emulsion; the elevation of the plasma triacylglycerol concentration was not significantly reduced by the mucilage in mice.

Effect of *Mimosa pudica* seed mucilage on the body weight, food intake, body fat, and liver weight in mice fed on a high-fat diet for six weeks

The mean food consumption per week, per mouse, did not significantly differ in the positive control group and the test group. The change in body weight, body fat, and liver weight are shown in Table 1. Feeding a high-fat diet plus mucilage did not significantly reduce

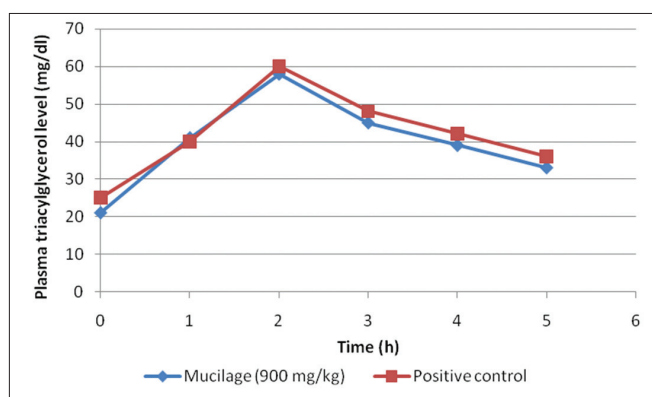
Table 1: Effect of *Mimosa pudica* seed mucilage on the body weight, food intake, body fat, and liver weight in mice fed on the high-fat diet for six weeks

Group	Body weight gain (g)	Total food intake (g)	Parametrial fat (g)	Liver weight (g)
Control	5.19 ± 0.90	6.73 ± 0.10	2.32 ± 0.37	4.45 ± 0.35
HF diet	6.21 ± 0.75	7.20 ± 0.25	2.16 ± 0.12	4.53 ± 0.70
HF diet + Mucilage	5.23 ± 0.54	6.94 ± 0.63	2.02 ± 0.23	4.46 ± 0.14

Table 2: Effect of *Mimosa pudica* seed mucilage on the blood parameters in mice

Serum parameter	Control	HF diet	HF diet + Mucilage
Total triacylglycerol (mg / dl)	96.79 ± 6.21	137.32 ± 12.03	138.41 ± 12.01
Total cholesterol (mg / dl)	132.23 ± 9.87	219.43 ± 51.08	194.93 ± 10.77
HDL-cholesterol (mg / dl)	48.55 ± 3.91	76.65 ± 8.05	46.69 ± 2.23
VLDL-cholesterol (mg / dl)	67.53 ± 6.07	172.7 ± 6.27	124.77 ± 8.38

HDL: High density lipoprotein cholesterol, VLDL: Very low density lipoprotein cholesterol HF: High fat diet

**Figure 1: Time-course characteristics of the plasma triacylglycerol concentration**

the body weight gain, body fat or liver weight, when compared to the control group fed on the high-fat diet alone during the study.

Effect of *Mimosa pudica* seed mucilage on the blood parameters in mice

Mimosa pudica mucilage did not significantly reduce the serum parameters, as shown in Table 2. The serum concentrations of TG, cholesterol, and VLDL-cholesterol were not significantly lowered in the test group, when compared with the positive control group. Furthermore, the mucilage did not increase the level of HDL-cholesterol.

CONCLUSION

The results clearly indicate that the *Mimosa pudica* seed mucilage does not exhibit marked anti-obesity activity in mice fed with a high-fat diet. Thus, the anti-obesity activity by reducing the appetite and increasing the feeling of satiety, and thus, limiting caloric intake of mucilage is not proven in the case of the *Mimosa*

pudica seed mucilage, in the present study. The lack of an anti-obesity effect may be because of the absence of fiber in the mucilage.

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