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A Study of the Impact of Morin Extract on Obesity Diseases Compared with Some Chemical Drugs used in Male Rats with Induced Obesity

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ABSTRACT

The study was conducted for the purpose of investigating the effect of morin and gallic acid on acute obesity in male rats from the first period of the month of December 2020 to January 2021. In college of Pharmacy, Al-AyenUniversity Animal house. Where a group of 60 male rats was selected and divided equally into six groups for each group of 10 adult rats, which were divided as follows. Control group, new obesity group, morin group only, gallic acid group only, obesity group with murine and obesity group with gallic acid. After the end of the experiment, all animals were sacrificed, each according to his group, and blood samples were collected for the purpose of the aforementioned tests, As the results of the current study showed that there are positive effects of morin and gallic acid on reducing the damages of obesity, and the effect of murine was higher and more than gallic acid.We therefore recommend expanding studies on this substance and recommending its use as a human medicinal product

KEY WORDS: Obesity,morin, gallic acid and Lipid Profiles.

INTRODUCTION

Obesity, the most common nutritional disorders in humans, is a major problem not only in Asia but also in all over the world.[1] According to World Health Organization (WHO), the prevalence of obesity is rapidly rising at an alarming rate to epidemic proportion globally. The International Obesity Task Force estimates that more than 300 million individuals worldwide are obese with body mass index (BMI) $\geq$ 30 kg/ m^2 and 800 million are overweight (BMI between 25 and 29.9 kg/ m^2). Currently, 66% of US adults are overweight or obese, 16% of US children and adolescents are overweight, and 34% are at risk of becoming overweight.[2] Obesity poses a major risk for serious diet-related chronic diseases, including type 2 diabetes, hyperlipidemia, cardiovascular disease, hypertension and stroke, obstructive sleep apnea, asthma, orthopedic disorders, social and mental health problems, and certain forms of cancer.[3] The use of natural products as therapeutic agents in preventing

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metabolic disease has become popular. Despite the fact that medicinal plants have been used for centuries to combat various ailments [9], it is only in the past few decades that we have seen a rapid rise in studies reporting on the metabolic disease preventative capacity of several plant bioactive compounds or naturally derived products, as reviewed elsewhere [10]. Such plant phenolics include gallic acid, a trihydroxybenzoic acid found in a variety of foods and herbs that are increasingly studied for its biological activities [11]. Morin (3,5,7,2,4-pentahydroxy flavone) found in several natural products such as almond (prunus dutcis), guava leaves (psidium guajava), figs (chlorophora tinctoria) and some other Maraceae family plants [12]. Several studies reported a variety of beneficial pharmacological effects of morin and other natural products, including antioxidant, antiinflammatory, antinociceptive, antihyperglycemic, and antiangiogenic effects [13]. Previously, morin was reported to have beneficial effect in reducing the blood pressure [14], improve endothelial dysfunction in diabetic animals [15], reduces blood glucose, serum lipid and liver triglycerides (TG) levels [16] and inhibit enzyme fatty acid synthase (FAS) [17].

MATERIALS AND METHODS

Experimental Design

Sixty adult males Wister rats divided to 6 groups in equals number of rat control(10 rats), fat(10 rats), morin(10 rats), gallic acid(10 rats), fat and morin(10 rats), fat and gallic acid(10 rats). For 40 days.

Measurement of Body Weight Gain and BMI

The increase in body weight was calculated as a difference between final body weight and initial body weight. The BMI was calculated by measurement of body weight (kg) divided by square of naso-anal length of rat [BMI = weight (kg) / length $(m)^2$].

Measurement of Biochemical Parameters in Serum

The concentrations of (LDH) and high density lipoprotein-cholesterol (HDL-C) (Reckon Diagnostics Pvt. Ltd., Baroda, Gujarat, India), glucose, total cholesterol (TC), and triglycerides (TGs), in serum were measured with commercial kits. The concentrations of insulin, in the serum were measured respectively with rat insulin ELISA kit (Alpco Diagnostics, Salem, NH, USA).

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Statistical Analysis

Statistical analysis was carried out using Graphpad Prism 3.0 (Graphpad software; San Diego, CA, USA). All results were expressed as mean ± standard error of mean (S.E.M.). Groups of data were compared with analysis of variance (ANOVA) followed by Dunnett's *t*-test. $P < 0.05$ was considered statistically significant.

RESULTS

Body weights

The results of the current study showed that morin has a positive effect on body weight compared to all study groups, as well as other materials also have a positive effect, but it does not rise to the effect of morin(fig:1).

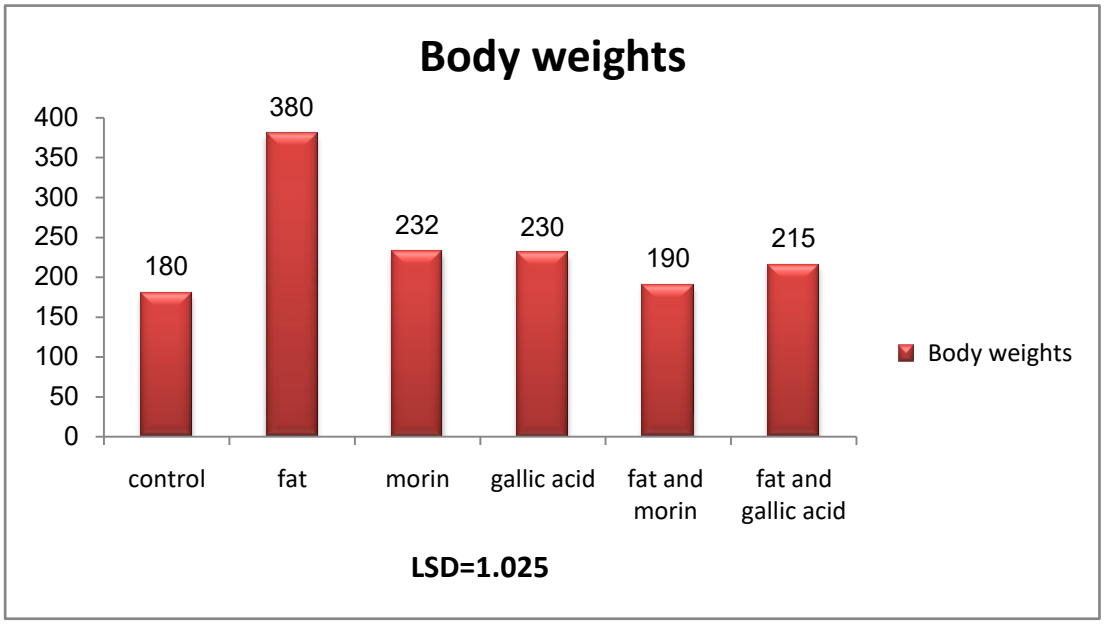

Fig 1: Effect of fat and morin and gallic acid on body weights of rats

LDL

The results of the current study showed that morin has a positive effect on LDL compared to all study groups, as well as other materials also have a positive effect, but it does not rise to the effect of morin(fig:2).

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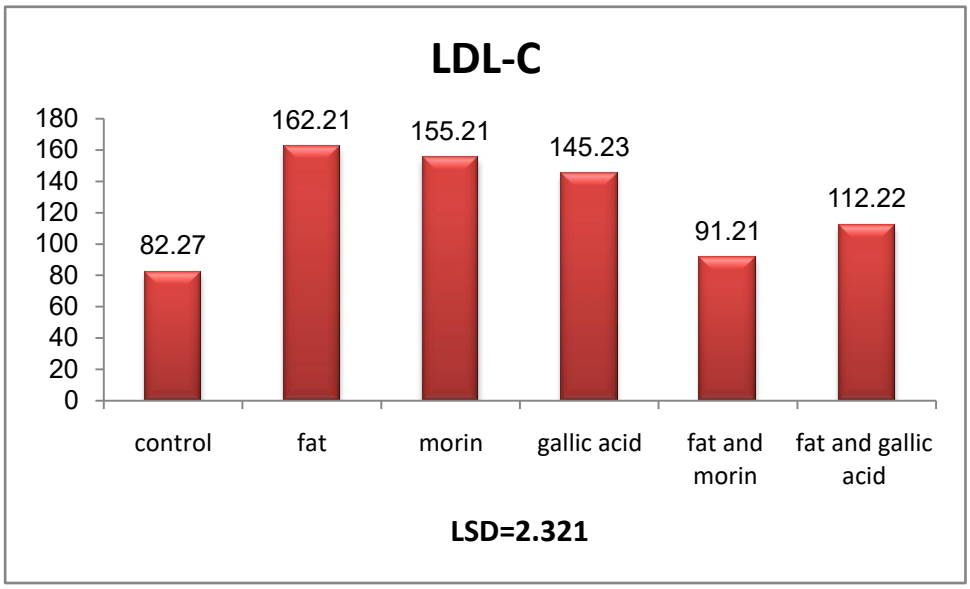

Fig 2: Effect of fat and morin and gallic acid on LDL of rats

HDL-C

The results of the current study showed that morin has a positive effect on HDL compared to all study groups, as well as other materials also have a positive effect, but it does not rise to the effect of morin(fig:3).

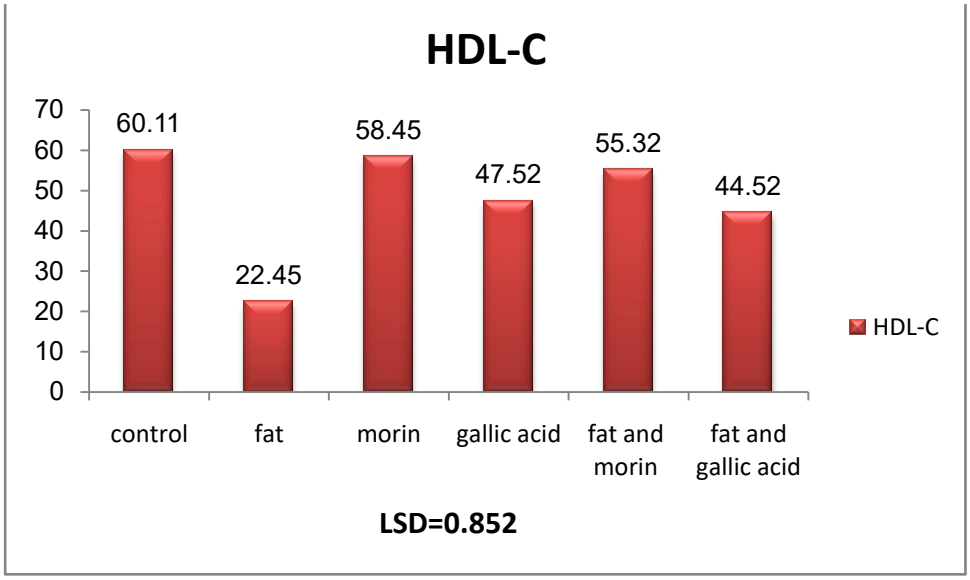

Fig 3: Effect of fat and morin and gallic acid on HDL-C of rats

Total cholesterol

The results of the current study showed that morin has a positive effect on Total cholesterol compared to all study groups, as well as other materials also have a positive effect, but it does not rise to the effect of morin(fig:4).

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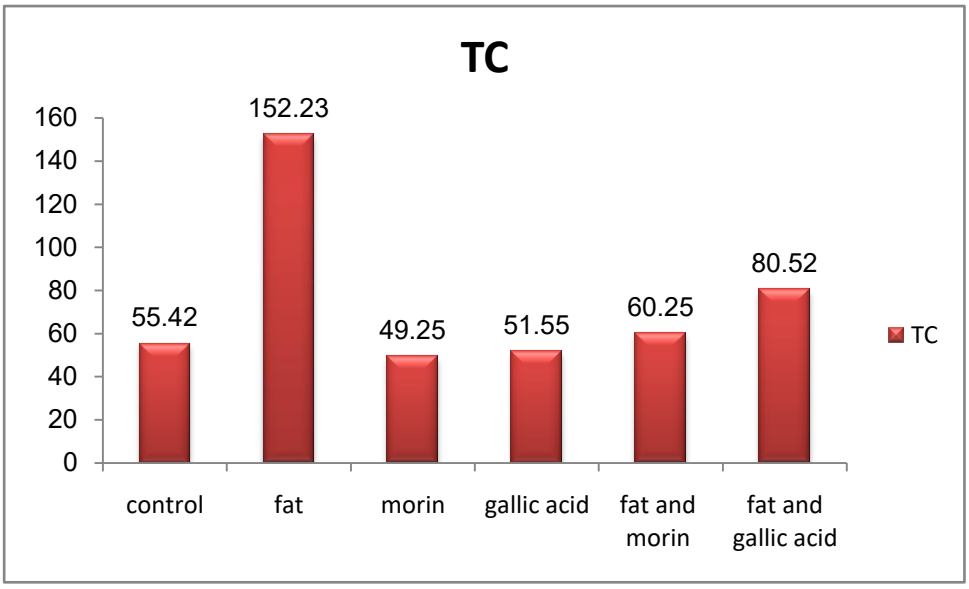

Fig 4: Effect of fat and morin and gallic acid on Total cholesterol of rats

Triglycerides

The results of the current study showed that morin has a positive effect on Triglycerides compared to all study groups, as well as other materials also have a positive effect, but it does not rise to the effect of morin(fig:5).

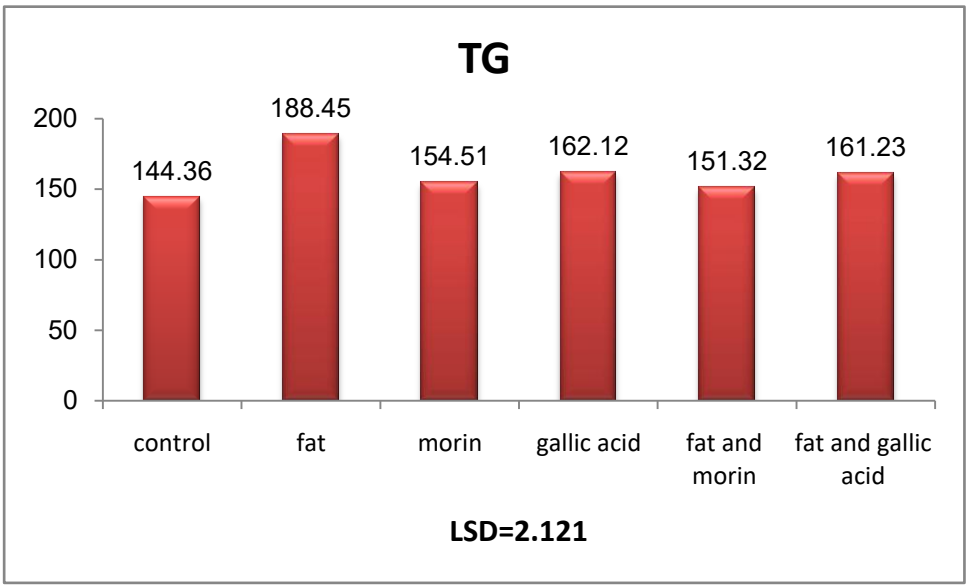

Fig 5: Effect of fat and morin and gallic acid on Triglycerides of rats

DISCUSSION

Obesity is a chronic disease and well known significant risk factor for various associated pathological disorders, morbidity, and mortality. It is confirmed and reported in earlier studies

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that obesity is associated with cardiovascular disorders, even though there is no effective treatment available for obesity and related vascular diseases. Therefore, the present study was aimed to investigate the medicinal use of morin in obesity-induced dyslipidemia and vascular endothelial dysfunction. The induction of obesity in animals by feeding with FAT has been reported in several studies and considered as the most popular and reliable model for studying obesity because the usual route of obesity episodes in human are pronounced similar [18]. In this present study, the medicinal use of morin was investigated at two doses of 50 and 100 mg/kg/day for three weeks against FAT-induced dyslipidemia and related disorders such as vascular endothelial dysfunction. FAT used in this study induced significant differences in adiposity as compared with MORIN groups, confirming our experimental model. Previous studies have shown and confirmed that excess fat intake is associated with increased body weight, which can further lead to a risk of obesity and several other metabolic disorders related complications [19]. This study corroborated with the previous findings and confirmed that rats fed with FAT for 12 weeks cause a significant increase of body weight, LW/BW, waist, Lee index, BMI, and food intake when compared with MORIN only fed rats. Whereas, morin treatment at both doses for three weeks in FAT-induced obese rats produced a significant decrease in body weight, LW/BW, waist, Lee index, BMI, and also decreased the amount of food consumed daily by rats when compared with FAT group. Therefore, it evidenced the weight-reducing potential of morin. The administration of morin to the FAT-fed rats at both the doses significantly suppresses the increased body weight accompanied by the significant decreases in average food intake comparative to rats fed with MORIN. It has been reported earlier that FAT-induced dyslipidemia resulted in a significant increase in serum TC, TG, LDL, and decreased HDL levels by improving the intestinal absorption and secretion, and decreasing cholesterol metabolism [20]. In the present study also, FAT treatment resulted in a significant increase of TC, TG, VLDL, and LDL levels while decreased HDL levels whereas, rats treated with morin at both tested doses significantly decreased the TC, TG, VLDL, and LDL levels while increased HDL levels similar to animals fed with MORIN. Morin administration significantly improves the lipid profile in FAT treated rats, as earlier [21] reported that flavonoids exerted hypolipidaemic activity in rats. It has been reported earlier that flavonoids lower the LDL levels and increases the HDL concentrations in hypercholesteremic animals[22]. FAT also resulted in the induction of oxidative stress in rats and caused increased oxidation of LDL, which plays a vital role in atherosclerosis. Therefore, antioxidants are the best option in preventing cellular damage caused by oxidative stress [23]. Previous literature reported that flavonoids offer further benefits against oxidative stress

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caused by hypercholesterolemia [20]. Obesity is also associated with vascular endothelial dysfunction probably because of several metabolic disorders, including atherosclerosis, hypertension, hyperglycemia, and dyslipidemia, which are accompanying vascular oxidative stress [24]. Many scientific reports confirmed the relation of hypercholesterolemia with impaired endothelium-dependent relaxation in atherosclerotic coronary arteries and angiographically smooth coronary arteries [25]. Various vasoactive substances are synthesized and released by the endothelium to regulate peripheral vascular resistance. Also, vascular endothelial dysfunction induced by FAT has been suggested to be caused by various factors, such as increased blood pressure, increased serum triglyceride levels, the overproduction of oxidants and insufficiency of antioxidant systems [26]. In the present study, FAT-induced dyslipidemic rats, treated with morin dose-dependently reversed the endothelial dysfunction (confirmed by increased Acetylcholine-induced vasorelaxation) comparable to morin group, whereas FAT rat's aorta did not show significant vasodilatation. This shows that morin treatment protected vascular endothelium from the harmful effects of FAT. Endothelial dysfunction provides a reasonable explanation of pathophysiologic mechanisms for the various harmful risk factors on coronary artery disease. Obesity can also lead to blood vessel disorders through the changes in vascular histology. In this study, the aorta of FAT fed rats showed the presence of fat accumulation in the form of adipocytes, weakness of elastic fibers layers, increased elastic collagen ratio indicated by increased collagen layer compared to the aorta of morin fed rats. Previous literature reported that increased body mass index is usually accompanying by hardening and thickening of the arterial wall [27]. These alterations found in this study corroborates with the previous findings as a significant predictors of increased cardiovascular mortality. However, morin treatment at the dose significantly restores the integrity of aorta and resulted in better improvement as showed by the almost normal architecture of aorta regarding all aspects of general features, elastic collagen ratio, and elastic fibers status. These findings suggest that treatment with morin restores vascular structural and functional integrity and histopathological alterations in obesity and other pathological conditions [28,29].

CONCLUSION

Antidyslipidemic and endothelial protecting effects of morin were found dose-dependent, as evident by improvement in the lipid profile and vascular endothelial function. Thus, this present study validates the medicinal use of morin in dyslipidemia and related cardiovascular disorders. However, there is still a need for further detailed studies to explore its mechanistic

approach that helps in obesity and related disorders management.

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