ORIGINAL ARTICLE

Chronic Consumption of Kombucha and Black Tea Prevents Weight Loss in Diabetic Rats

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ABSTRACT

OBJECTIVE: Diabetes mellitus (DM) is a chronic metabolic disease which affects many organ systems in the body and is associated with a progressive weight loss. Many diabetic patients used to consume herbal remedies to relieve their symptoms. Black tea and its fermented remedy which is made by cultivating the Kombucha mushroom in a mixture of warm tea and sugar are widely used by diabetic patients throughout the world.

In this study, the effect of chronic consumption of black and Kombucha tea on weight loss was investigated in diabetic Rats.

MATERIALS AND METHODS: In this study Streptozotocin (60 mg/kg) was used to induce diabetes mellitus in rats and blood glucose higher than 300 mg/dl was considered as the criterion for the diabetes induction. Control animals received tap water while the sham and test groups consumed sweet black tea solution and different diluents of Kombucha tea solution (25%, 50%, 75% and 100%), respectively for 15 days as their drink. Animals weight was measured before DM induction and on days 1, 3, 7 and 15 after DM induction. Data were analyzed as mean ± SEM on different days and in different groups by using T-test and one-way ANOVA.

RESULTS: All diabetic animals showed a significant weight loss ($P < 0.05$) which continued progressively in control group, but in animals consuming black or Kombucha tea, there was a progressive weight gain during the experimental procedure, so at the end of the experiment, the animals weight in these groups was the same as their weight before DM induction ($P > 0.05$). At the end of this experiment there was no significant difference in the animals weight in black and Kombucha tea groups ($P > 0.05$).

CONCLUSION: According to our findings both black and Kombucha tea induce weigh gain in diabetic rats which may be due to some antidiabetic agents in these remedies.

KEYWORDS: Kombucha Tea, Black Tea, Diabetes Mellitus, Weight Loss, Rat.

INTRODUCTION

Diabetes Mellitus (DM) is a complex disease with a high prevalence. The international diabetic federation estimates that the prevalence of diabetes is about 7% in the United States (1,2). In Iran more than 2 million adults (7.7%), aged 25-64, suffer from diabetes (3). On the other hand, beside the

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presence of synthetic antidiabetic drugs, a large and increasing number of patients use medicinal herbs or seek the advice of the physicians regarding their use (4-5). One of these herbal medications which are relatively popular in diabetic patients is Kombucha tea (6). The principle element of this beverage is black tea which contains myricetin that mimics insulin in stimulating lipogenesis and glucose transport in rat adipocytes in vitro(7). Therefore, we conducted this study to compare the effect of black tea and Kombucha tea on weight loss in Streptozotocin induced diabetic rats, in a lab trial experimental procedure.

MATERIALS AND METHODS

In this study 42 male Wistar Rats weighing 200±5 were divided into six groups. DM was induced by intrapretoneal injection of streptozotocin (60 mg/kg) in all groups. Animals in the first group (control) hadfree access to tap water, the second group (sham) consumed sweet black tea solution and the remaining 4 groups (test) received different diluents of Kombucha tea (25%, 50%, 75% and 100%) for 15 days instead of tap water. Animals in all groups were weighed before DM induction and on days 1, 3 , 7 and 15 after DM induction. The data were analyzed as Mean ± SEM of weights on different days and in different groupsusing T-test and one-way ANOVA.

RESULTS

Our results showed that all groups had a significant weight loss due to DM induction ($P < 0.05$, Figure 1) which continued progressively in control group (Figure2), but in sham and test groups there was a progressive weight gain during the 15 days of remedy consumption (Figures 3,4). So there was no significant difference in animals weight in sham and test groups at the end of the experiment and their weight before DM induction ($P > 0.05$). There was also no significant difference in the animals weight ratio (% weight on day 0/weight on day 15) in sham and test groups at the end of this period ($P > 0.05$, Figure 5).

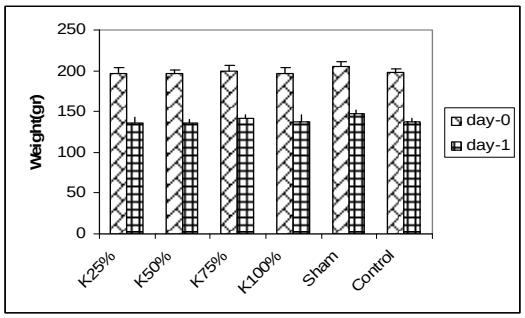

Figure 1- Effect of Diabetes Mellitus induction on animals weight in different test (K-25-100%), sham and control groups. (n = 7). Weight loss was significant in all groups ($P < 0.05$).

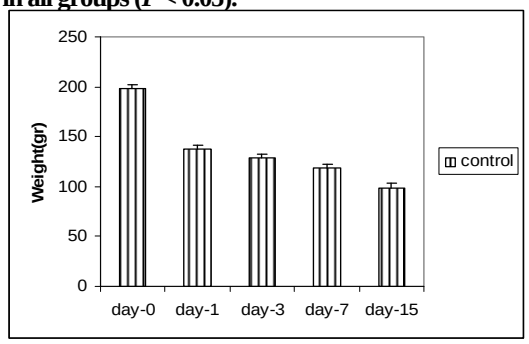

Figure 2- The effect of Diabetes Mellitus on weight loss during subsequent days after diabetes induction in control group (n = 7). The weight loss on day 15 as compared with the day 0 was significant ($P < 0.05$).

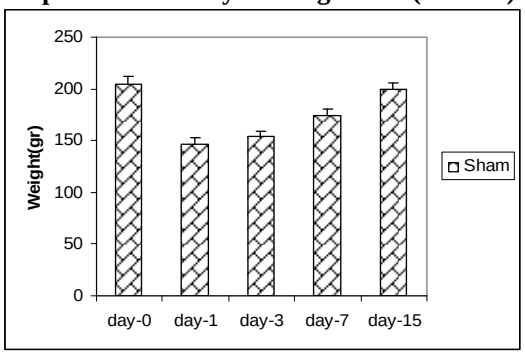

Figure 3- The effect of black tea on weight in Diabetic Rats during subsequent days after Diabetes induction (n = 7). There was no significant difference in weight on day 15 and day 0 ($P > 0.05$)

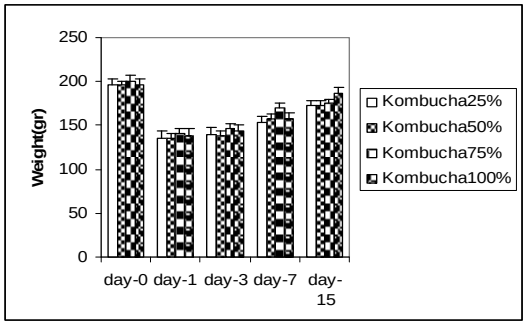

Figure 4- The effect of different concentrations of Kombucha tea on weight in Diabetic Rats during subsequent days after Diabetes induction (n = 7). There was no significant difference in weight on day 15 and day 0 ($P > 0.05$)

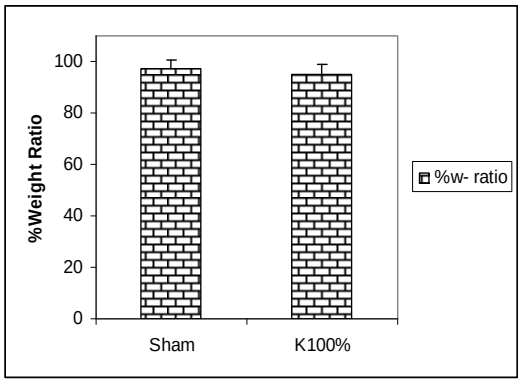

Figure 5- A comparison between the percent of weight ratio (weight on day 15/weight on day 0) in sham (black tea) and test (100% Kombucha tea) groups 15 days after Diabetes induction (n = 7). There was no significant difference in the percent of weight ratio in these groups ($P > 0.05$).

DISCUSSION

Tea is a beverage with the greatest consumption worldwide. There are 3 categories of tea: black, green, and oolong. Consumption of black tea accounts for 80% of total tea intake (8). Black tea leaves are fermented and contain mostly theaflavins and its major phytochemicals are phenolic compounds like flavonoids and phenolic acids (9). Flavonoids are ubiquitous in plants; almost all plant tissues are able to synthesize flavonoids. The number of flavonoids may be close to 5000. The most important flavonoids are quercetin, kaempferol, myricetin, and chrysin which are found in most fruits and vegetables (10). The content of flavonoids in various beverages like tea and wine is very high (11). Black tea infusions prepared with tea bags (4.0 or 5.0 g) contain 17-25 mg/l quercetin, 13-17 mg/l kaempferol, and approximately 3 mg/l myricetin (8). The contents of catechins range 3-10% (wt/wt solids) (12). Edible plant material also contains numerous weakly estrogenic diphenolic compounds termed phytoestrogens which are lignans, isoflavones, coumestans, and resorcylic acid lactones. The precursors of these compounds are to be found in fiber-rich unrefined grain products, various seeds, cereals, legumes and tea (13-14). Several epidemiological studies suggest that black tea consumption is associated with a reduced risk of degenerative diseases such as cardiovascular diseases (15), cancers (16) and diabetes mellitus (17). The most effective agents in tea that prevent and/or treat the diseases are flavonoids, content of which is very high in tea (9-10). One of these polyphenolic agents is myricetin which mimics insulin in stimulating lipogenesis and glucose transport in rat adipocytes in vitro. Myricetin-stimulated glucose uptake is possibly due to a change in the intrinsic activity of the glucose transporter, caused by alterations in membrane fluidity or transporter-lipid interactions, as a result of the insertion of myricetin into the membrane bilayer. Thus, myricetin may have a therapeutic potential in management of non-insulin dependent diabetes mellitus by stimulating glucose uptake, without the presence of fully functional insulin receptors (7). Our results also indicate the effectiveness of black tea in reversing weight loss which is one the most important signs of the streptozotocin induced diabetes mellitus in rats (18). This is despite the fact that tea consumption has a potency of increasing energy expenditure and fat oxidation in normal (non-diabetic) subjects which lead to weight loss (19). On the other hand, there was a similar effect for Kombucha tea which is a beverage made by cultivating a mushroom in black tea. Although the components of Kombucha tea are quite different from that of black tea, antidiabetic effect of this beverage may also be due to polyphelonic residues from the black tea as the basic element of Kombucha teawhich needs further investigations.

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