



Common herbal plants and their role in control of obesity

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Abstract

Obesity is quite common around the globe and linked with the increased prevalence of various other diseases including: immune dysfunction, diabetes, depression, cancer and cardiovascular disorders. Obesity is induced by the diet is usually due to disproportionate intake of calorie enriched diet, lack of physical activity and reduced energy consumption. Worldwide, it was estimated that an average of 603.7 million adults and 107.7 million children were found to be obese in 2015. It was also observed that the prevalence of obesity is quite greater in females than males. The incidence rate of obesity was 12.0% among adults and 5% among children. In 2015, approximately 4 million deaths were reported around the world due to increased BMI. The current review is aimed to study common herbal plants which have proven anti-obesity effect and could be used in the routine diet to reduce weight and to improve the quality of life. The databases used for this review were included Google Scholar, PubMed, Scopus and Medline. There are many common herbal plants and spices which are used in daily routine that could be helpful in reducing weight. Black Chinese tea, *Nigella Sativa*, Green Tea and *Camellia synensis* has exhibited promising anti-obesity activity. To reduce the prevalence of obesity and to improve the quality of life better strategies should be considered. Physicians and other health care professionals with pharmacological interventions should recommend change in daily routine life to patients for better outcomes

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Introduction

Obesity is quite common around the globe and linked with the increased prevalence of various other diseases including: immune dysfunction, diabetes, depression, cancer and cardiovascular disorders. So, right approach should be taken into account to loss the weight and other resultant abnormalities (Vanamala *et al.*, 2012). Worldwide, it was estimated that an average of 603.7 million adults and 107.7 million children were found to be obese in 2015. It was also observed that the prevalence of obesity is quite greater in females than males. Obesity is also associated with polycystic ovary syndrome which is characterized by ovarian dysfunction, hirsutism and acne (Mahmood *et al.*, 2011). The incidence rate of obesity was 12.0% among adults and 5% among children. In 2015, approximately 4 million deaths were reported around the world due to increased BMI. Further, increased BMI was resulted to 120 million disability-adjusted life-years. As link to the BMI, about 39% of the mortalities and 37% of the disability-adjusted life-years were found in people having BMI <30 (Collaborators, 2017). Overall, global economic burden of the obesity was predicted to be 2 trillion US dollars in 2014 (Tremmel *et al.*, 2017). The major reason behind the increased incidence of obesity is probably surplus ease to access and affordability of energy-dense foods. The marketing of such food products and utilization may the key cause of weight gain (Swinburn *et al.*, 2011). Obesity is quite common in both developed and developing countries. Pakistan is an emerging country and ranked on 9th highest position regarding obesity monetary burden (Ahmad *et al.*, 2015). Pakistan is facing many challenges like lack of health resources, malnutrition, trend shifting towards the fast food, occurrence of non-communicable including obesity and economic burden. Due to lack of the regulatory control, the fast food industry is expanded abruptly in Pakistan which resulted into the weight gain and its comorbidities (Sajjad and Qureshi, 2018). Better strategies should be considered to reduce the prevalence of obesity and improve the quality of life (Kanwal *et al.*, 2015; Tanveer *et al.*, 2019). Physicians and other health care professionals with

pharmacological interventions should recommend change in daily routine life to patients for better outcomes (Howard, 1981). Obesity is induced by the diet is usually due to disproportionate intake of calorie enriched diet, lack of physical activity and reduced energy consumption. Due to imbalance between the energy intake and utilization either fat cells are increased in size or number (He *et al.*, 2009). Complementary and alternative medicine (CAM) including change in dietary habits and herbal supplements are proven to be effective in the treatment of weight loss (Barnes *et al.*, 2002). In 2002, World Health Organization (WHO) has recommended the Asian countries to reduce the BMI cut-off values (Aziz and Sohail, 2016). Many therapeutically useful compounds are being isolated from herbs and used in treatment of various ailments (Tanveer *et al.*, 2019). There are many common herbal plants and spices which are used in daily routine that could be helpful in reducing weight. Black Chinese tea, *Nigella sativa*, Green Tea and *Camellia synensis* has exhibited promising anti-obesity activity. It is recommended that dose of the medicinal herbs should be determined for effective treatment and possible side effects (Hasani-Ranjbar *et al.*, 2013). In an investigation, 53 medicinal plants were studied for their possible anti-obesity effects. Black tea, Glycyrrhizaglabra, licorice, Saturejakhuzestanica, Fenugreek, cherry, garlic powder (Allisor) and rhubarb stalk has demonstrated a significant reduction in total cholesterol and LDL cholesterol levels (Hasani-Ranjbar *et al.*, 2010). A research was conducted on processed tomato vinegar beverage TVB to evaluate anti-obesity and anti-insulin effects and outcomes has showed the reduction in insulin resistance and visceral obesity (Seo *et al.*, 2014). Tomatoes not only helpful in weight drop but also reduce the risk for the chronic inflammatory diseases (Hazewindus *et al.*, 2014). The current review is aimed to study common herbal plants which have proven anti-obesity effect and could be used in the routine diet to reduce weight and to improve the quality of life. The databases used for this review were included Google Scholar, PubMed, Scopus and Medline (Abid *et al.*, 2019).

Role of herbal plant in controlling obesity

Orange peel

Orange peel or bitter orange peel (*Citrus aurantium*) belongs to family Rutaceae. Many valuable phytochemicals have been isolated, named: synephrine, hordenine, N-methyl tyramine, octopamine, flavonoids, volatile oil and Vitamin C. The isolated compound named Synephrine has significant pharmacological activities such as bronchial muscle relaxation and constrictions of vessels. The fruit extracts of the orange peel is widely used to cure multiple diseases such as infections, obesity and cancer (Suryawanshi, 2011; Arshad *et al.*, 2019). In a research, orange peel has been evaluated for the anti-obesity effects. The extracts of orange peel were given to the female mice in combination with caffeine and black tea. It was observed that the mice which taken such combination of diet have exhibited reduction in abdominal fat and in brown adipose tissue (Huang *et al.*, 2009). Another study has also proven the weight loss effects of orange peel by using in vitro model. The outcomes of the study have confirmed that the citrus polyphenols cause lessening of the cell lipid contents along adipocyte differentiation (Nakajima *et al.*, 2014).

Licorice

Glycyrrhiza glabra is famous as a "licorice". The herb has remarkable properties to reduce obesity. An investigation has done on the plant to prove its anti-obesity effect and for this herb supercritical fluid extract enriched with glabridin was used. For study fat diet was given to rats and anti-obesity effect was observed for about eight weeks. This chemical reduces the obesity by interfere the process of adipose cells generation (Ahn *et al.*, 2013). In Korea, about eight hundred species of the plant was tested to investigate the anti-obesity effect. A chemical known as licochalcone was proved to be effective and it is separated from the *Glycyrrhiza uralensis* root extract. This research has also proved that licochalcone impede the formation of oleic acid by pancreatic lipase (Won *et al.*, 2007). A placebo-controlled study were conducted which was double blinded. For this study slightly obese subjects were chosen, included 56

males and 28 females and they were divide into 4 groups. Daily a placebo dose was given to the participants and sample of the bloods were monitored for the BMI for eight weeks. The study has exhibited that total body fat mass declined in three LFO groups (Tominaga *et al.*, 2009). A double blind placebo controlled investigation was conducted to evaluate the dried licorice extract with a calorie restricted diet on anthropometric indices and insulin resistance with nutrigenetic approach. For this study, subjects (n=2) were randomly assigned to placebo or licorice group. It was concluded that in overweight participants, the Pro/Pro polymorphism of the PPAR- γ 2 gene seems to encourage promising effects on control of obesity. However Further research is still required to verify that PPAR- γ 2 gene polymorphisms or another obesity genes can affect responses to obesity cure and management (Namazi *et al.*, 2017).

Cardamom

Elettaria cardamomum is known as cardamom and belongs to family zingiberaceae. A research was done the on Sprague-Dawley rats to check the hypoglycemic and anti-obesity effect which was instigated by alloxan. This study was performed on 45 rats which were equally divided into three groups of the rats. Samples were taken at three intervals daily for about 14 days to monitor the the blood glucose and cholesterol. The outcomes of the study have shown a marked reduction in glucose and cholesterol level hence proved effective for obesity and hypoglycemic effects (Winarsi *et al.*, 2014). Another study was conducted on animals also proved herb beneficial effect to reduce obesity (Daneshi-Maskooni *et al.*, 2017). An investigation was carried on albino rats to compare the hyperglycemic and anti-obesity activity of cardamom with pioglitazone and dexamethasone. In this study 24 rats were uses and split into 4 groups. One group received dexamethasone and second group received cardamom suspension along with and before consuming dexamethasone for 6 days. The third group received pioglitazone and last group did not receive any medication. Both cardamom and pioglitazone reduced the hepatomegaly and cause weight loss and reduce the blood sugar level (Bhat *et*

al., 2015).

Gurmar

The botanical name of the Gurmar is *Gymnemasylvestre* and belongs to Asclepiadaceae family. The most significant active constituents of Gurmar is Gymnemic acid and it has hypoglycemic, anti-inflammatory and anti-helmentic activity (Saneja *et al.*, 2010). The usual recommended dose of leaves is 75-150 mg to reduce the obesity (George and Nimmi, 2011). The chief phytochemicals of Gurmar are including gymnemic acids, gymnemasaponins, and a polypeptide, gurmarin. Its herbal extract used to reduce the blood cholesterol and also reduce body weight (Tiwari *et al.*, 2014).

Black cumin

Nigella sativa is a common herb and used widely to treat many disorders. It was used by Unani physicians of customary medicine (*Hakims* or *Tabibs*) and ayurvedic practitioners (*Vaids*) for the cure of many pathologies i.e. dyslipidemia, hypertension and obesity (Qidwai *et al.*, 2009). A study has conducted to provide an explanation of herb extracts effects on adipocytes and PPAR γ .

The findings of the study have revealed the plant extract act as an agonist of PPAR γ . The outcomes of the research data have suggested that *N. sativa* seed oil has potential to cure obesity and to reduce increased blood sugar (Benhaddou-Andaloussi *et al.*, 2010). Many studies have indicated that the plant has anti-cancer, cardio-protective, anti-diabetic and immune-modulatory properties. Black cumin also exhibit marked anti-oxidant properties by preventing generation of reactive oxygen species (Tanveer *et al.*, 2014). Herb active phytoconstituent called hymoquinone has revealed bioactivity in a variety of disease models and still the mechanisms of action is not known. Further growing interest in and the use of functional foods and nutraceuticals, as well as the rise in obesity and chronic diseases globally, more investigations are needed to verify useful effects of the plant (Vanamala *et al.*, 2012).

Tea

Tea or *Camellia sinensis* is belongs to family Theaceae. Polyphenols have been isolated from the tea plant and studied for their potential role to treat chronic disorders with special reference to obesity. Various scientific studies have exposed the impending effectiveness of both black and green tea to reduce the weight. However, exact mechanism is still unknown and is needed to be explored (Grove and Lambert, 2010). It has been shown that green tea, when consumed on a daily basis, supports health. Many of the beneficial effects of green tea are related to its catechin, particularly (-)-epigallocatechin-3-gallate (EGCG), content. There is conclusive evidence from *in vitro* and animal studies which provide the concepts for underlying functional mechanisms of green tea catechins and their biological actions (Thielecke and Boschmann, 2009).

Garlic

Till then many studies have conducted on garlic to validate the wisdom behind its use to reduce weight and hyperlipidemia. A research was performed on obese rats to discover the effects of garlic oil and onion oil on serum lipid levels. For study, ninety six male Sprague-Dawley rats were used and divided into 8 random groups on basis of their blood levels of triglycerides, cholesterol and body weight. For about 60 days, they were given extracted volatile from the plant orally and then different obesity measuring parameters were examined. The results of study have implied that garlic oil and onion oil are effective in controlling the obesity (Yang *et al.*, 2018).

Onion

Weight reducing potential of the onion (*Allium cepa*) extract was evaluated in both obese and diabetic Zucker diabetic fatty rats. The efficacy of the results was determined by assessing the relevant obesity and diabetes markers. The findings of the study have confirmed that the onion is quite effective in minimizing the serum glucose level and lipid profile. Onion contains many useful constituents like cycloalliin, *S*-propyl-l-cysteine sulfoxide, *S*-methyl-l-cysteine, dimethyl trisulfide and *S*-methyl-l-cysteine

sulfoxide were reported to be effective in inhibiting formation of oil drop in the cells, suggesting that these compounds may be involved in the anti-obesity effect of the onion extract (Yoshinari *et al.*, 2012). Male 8 week old mice were purchased (n=60) and they were kept under standardize conditions and divided into 5 groups and they were fed on HFD and normal saline 2g/kg /day for 10 weeks and control group was fed only normal saline the body weight of mice fed the high fat diet was higher than that of mice fed the normal diet by approximately 32.5%. In the orlistat treated group as positive control the body weight was significantly decreased by approximately 16.5% (Sung *et al.*, 2014). A research has also proved that the administration of onion reduced the size of adipocyte and serum hyperlipidemia in obese rats. Moreover, the antihypertensive effects of onion were also noticed. It is suggested by the study that onion reduces the serum lipid components and improves hypertension in obese rat (Kanfet *et al.*, 2010).

Tomato

Tomato or *Solanum lycopersicum* is widely used across the world and embraced with many valuable chemicals which are effective for the treatment of many ailments. A study was conducted to evaluate the tomato and broccoli extracts for control of obesity and to regulate glucose homeostasis through the modulation of resistin levels. There is an association between the resistin and obesity. For study 48 male albino rats were used and investigated for about 1 month. By using the ELISA and spectroscopic techniques, levels of leptin, resistin, adiponectin, insulin and glucose were determined. The outcomes have shown that tomato and broccoli extract treatment regulates glucose homeostasis via reduction of serum resistin and may be a useful non-pharmacological therapy for obesity (Aborehab *et al.*, 2016). Intake of vegetable is more beneficial against many diseases also including obesity which is a major health problem now a day. Tomato is a beneficial vegetable that could help in weight reduction. A study was performed on zebra fish because we can feed every type of vegetables to zebra fish. After giving tomato's to the zebra fish a marked reduction in

weight was observed (Tainaka *et al.*, 2011). Tomato and vinegar also inhibit the deposition of different types of fats in body and decreased the cholesterol level in liver and plasma (Lee *et al.*, 2013). Now great consideration is given to use of herbs, vegetables and fruits for the control of weight as these dietary approaches are safe and effective. Tomatoes contain carotenoids in abundance which play a key role in human to reduce the free radicals and hence act as the anti-oxidant (Pinela *et al.*, 2016). It also contains the vitamin C called ascorbic acid and vitamin E called tocopherol which also play a significant role in reduction of weight (Davey *et al.*, 2000; Baiano and Del Nobile, 2016) as these chemicals also have a function of antioxidant (Lee *et al.*, 2004) and intake of tomato can maintain balance of the such vitamins in body (Abushita *et al.*, 2000; Singh and Jialal, 2004).

Ginger or *Zingiber officinale* has both non-volatile and volatile constituents. The extracts of the ginger are commonly used to treat many diseases and by studies many potential roles of the plant has verified (Misawa *et al.*, 2015). The plant contains many valuable active compounds that lower the blood cholesterol, improve digestion and reduce the weight (Srinivasan, 2017). At a dose of 800mg/dl, the plant volatile components remarkably reduce the body glucose and fat. Hence it can be used to treat obesity and diabetes (Andallu *et al.*, 2003; Jewole, 2006).

Conclusion

Obesity is quite common around the globe and linked with the increased prevalence of various other diseases including: immune dysfunction, diabetes, depression, cancer and cardiovascular disorders. The major reason behind the increased incidence of obesity is probably surplus ease to access and affordability of energy-dense foods.

The marketing of such food products and utilization may be the key cause of weight gain. There are many common herbal plants and spices which are used in daily routine that could be helpful in reducing weight. Black Chinese tea, *Nigella sativa*, Green Tea and *Camellia sinensis* has exhibited promising anti-obesity

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