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Potential of Traditional Medicinal Plantsfor Treating Obesity: A Review

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Abstract. Obesity is a global health concern associated with high morbidity and mortality. Therapeutic strategies include synthetic drugs and surgery,which may entail high costs and serious complications. Plant-based medicinal agents offer an alternative approach. A review of the studies on accessible botanical sources for the treatment of obesity is provided, which attempts to explain how these medicinal plants act to cause weight loss, and which approach is safer and more efficient. Information was gathered forthe period of 1991 to 2012. Five basic mechanisms, including stimulating thermogenesis, lowering lipogenesis, enhancing lipolysis, suppressing appetite, and decreasing the absorption of lipids may be operating. Consumption of standardized medicinal plant extracts may be a safe treatment for obesity. However, some combinations of medicinal plants may result in either lower efficacy or cause unexpected side-effects.

Keywords: Medicinal plants, Adipose-tissue differentiation, Fat absorption, Slimming aids, Dietary supplements

1. Introduction

By 2005, obesity had affected 400 million adults [66], and since 1997, WHO has cited obesity as a global epidemic [3, 8]. More than half of the adult population in OECD countries is overweight (body mass index [BMI]≥25 Kg/m^2) [10]. According to WHO, obesity is related to cardiovascular diseases, hypertension, diabetes mellitus, gallbladder disease, cancer, endocrine and metabolic disturbances, osteoarthritis, gout, pulmonary diseases, as well as psychological issues, including social bias, prejudice, discrimination, and overeating [65]. Economically, obesity and its health consequences place enormous costsnow and for future health care [13, 49, 67].Being overweight is a cosmetic issue, a major health risk factor [33], and maydecrease life expectancy [46].A proliferation of high-cost, anti-obesity productsis in the market[25]. However, they exhibit side effects, such as gastrointestinal and kidney problems [25, 55], and only *Orlistat*and*Sibutramine* can be used long-term, in spite of issues regarding weight loss and tolerance[50, 51]. The use of natural remedies for weight loss has increased, based on reliability, safety, and cost compared with synthetic drugs [11] or surgical procedures[12], which may havelimitations [40].

1.1. Natural Medications

Natural ingredients and medicinal plant preparationsmay enhance satiety, boost metabolism, and speed up weight loss [34, 43]. Including these foods in the diet may therefore assistslow, individual weight loss. However, doubts about human application remain[58]. Despite the global market for satiety, fat burning,

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dietary supplements and other weight management remedies, patient awareness of these products is insufficient [15]. Here, a brief review of natural medicinal agents and their anti-obesity potential is presented which could aidpatients in selectinga botanicalproduct to develop a healthy body.

2. Methods of Data Collection

Data were acquired from various databases, includingScience Direct, Pub-Med, Scopus, Web of Science, and from books and theses for the period from 1991 until January 2012. Key search words included: *traditional medicine, medicinal herbs, plant extracts, anti-obesity, weight loss, overweight, botanical remedy, complementary therapy, natural, alternative, phytonutrients, phytochemicals, efficacy, safety, bioactive compounds, appetite, satiety, metabolism, thermogenesis, lipolysis, lipogenesis, adipocytes* and *anthropometric indices*. Papers on human and animal studies, clinical trials, and related toplant-based obesity medication are discussed.

3. Results and Discussion

3.1. Mechanism of Action

Natural anti-obesity preparations can induce weight loss through several mechanisms. Their functions can be classified into five major categories, as shown in Table 1.

Table1: Different functions of anti-obesity medicinal plants in humans

No.	Anti-obesity function	Anti-obesity preparations
1	Inhibiting pancreatic lipase activity	chitosan [7, 27], levan [28], mate tea [41], oolong tea [23] jasmine tea [45], green tea [32]
2	Enhancing thermogenesis	sea weed [36, 38, 39], bitter orange [14, 19, 52], soybean [24]
3	Preventing adipocyte differentiation	turmeric [1], capsicum [22], palm oil [62], banana leaf [4, 31], brown algae [37], garlic [2], flaxseed [60], black soybean [29]
4	Enhancing lipid metabolism	herb teas [45], cinnamon [57]
5	Decreasing appetite	pine nut [48], pomegranate leaf [35], ginseng [30], *Hoodia gordonii*[63]

Based onpancreatic lipase activity inhibition[5], some medicinal plants will prevent the intestinal lipid absorption, and non-absorbed fat will be excreted through oily faeces. Certain bioactive components can increasethe metabolic rate[20] which enhances thermogenesis and helps burning calories and excess body fat. Prevention of adipocyte differentiation [62] throughmedicinal plant may inhibit adipogenesis and fat cellformation, and based on enhanced lipolysissome medicinal plantscan increase lipolysis through inducing β-oxidation or noradrenaline secretion in fat cells [45]. Other anti-obesity ingredients may suppress appetite and induce satiety [16],allowing for appetite control.These differing functions of antiobesity medicinal plants will result in a reduction of food and energy intake [19].

3.2. Approaches in Medicinal Plant Preparation with Maximum Efficacy and Safety

Medicinal plant samples may be the whole plant, or plant parts (stem, bark, leaf, flowers, and roots). These materials may be presented as powder or capsules, although the medicinal plants showing antiobesity properties were aqueous or alcoholic extracts. In this way, components inhibitingthe anti-obesity compounds may be removed.Extraction, partial purification, and/or the isolation of active principle(s)could increase bioactiveconstituent bioavailability in the extracts, and enhance medicinal agent efficacy in weight loss[9, 56]. However (Table 2), different antiobesity preparationsin combination with other medicinal plantsmay produce unexpected side-effects.

The application of single medicinal plants has not caused any adverse events. The undesiredhuman effects may be due to interactions between the different phytochemical constituents present in the different plants[21].

4. Summary and Conclusions

Based on a number of *in vivo* studies regarding the efficacy of anti-obesity medicinal plant preparations, they may act by stimulating thermogenesis, lowering lipogenesis, enhancing lipolysis, suppressing appetite, and decreasing lipid absorption. Single and mixed anti-obesity medicinal plant preparations may have

different effects. The botanical sources, route of administration,presence of various bioactive components and their respective functions, experimental methods used, treatment dosage, study design, treatment duration, andsafety and efficacy of the plant are also factors.

In conclusion, the dietary intake of the singlemedicinal plantsmayprovide a higher degree of safety and efficacy than mixed medicinal plant preparations. These findings support health organization recommendation regarding the regular consumption of vegetables and selected herbs, such as turmeric, capsaicin, ginger, and green tea. Improving knowledge on the use of anti-obesity medicinal preparations, and encouraging obese patients to consume them along with an enhanced exercise regimen and a healthy diet should be continued. Additional chemical, biological, and clinical studies are needed on the effectiveness of selected medicinal plants, particularly those used as spices and condiments, in ameliorating and treating obesity in humans. Such anti-obesity data would be useful for food and drugmanufacturers as new products are developed, and to governments in the regulation of food products as a way to promote and enhance public health.

Table 2: Comparison ofsafety and efficacy of single and mixed medicinal plant anti-obesity preparations

Medicinal Plant ingredient	*Result	Adverse effects	Combination formula	Result	Adverse effects
Rhubarb (rheum) [26]	+	Not reported	In combination with ginger, astragulus, red sage, turmeric, and gallic acid[18, 53]	greater weight gain in intervention group/ (-)	Musculoskeletal, gastrointestinal, oral, dermatologic, vaginal irritation, headache, etc.
Green tea (*Camellia sinensis*)[44]	+ ($p<0.05$)	Not reported	In combination with asparagus, black tea, guarana, kidney bean, *Garcinia cambogia*and chromium yeast [47]	no inter group difference in weight (-)	Gastrointestinal complaints
Bitter orange *Citrus aurantium*) [59]	+	Not reported	In combination with pantothenic acid, green tea leaf extract, guarana, white willow bark and ginger root [17]	greater weight gain in intervention group ($p<0.04$)	Hypertension, musculoskeletal, neurological, migraine, anxiety
Kidney bean (*Phaseolus vulgaris*) [61]	+ ($p=0.07$)	Not reported	In combination with green tea extract[6]	inter group diff. (+)	Flatulence, soft stool, constipation
Garcinia cambogia[42]	+ ($p=0.03$)	Not reported	in combination with natural caffeine [54]	No inter group diff. ($p=0.3$)	Not reported
Glucomannan fiber [64]	+ ($p<0.005$)	Not reported	in combination with chitosan, fenugreek, *Gymemna sylvestre*, vitamin C [68]	inter group differences (+) ($p<0.01$)	Constipation, headache, indigestion

* Results indicate the efficacy and intergroup differences

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