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Review Article

Medicinal Plants for the Treatment of Obesity

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Abstract:

A persistent increase in morbidity indicators has been connected to the global epidemic of obesity; it is regarded as a societal issue & poses significant health dangers. Synthetic medications and surgery are examples of therapeutic approaches; both have high prices and potentially dangerous side effects. Plant-based drugs provide an alternative strategy. Traditional uses of medicinal plants are one of the options for treating obesity, and they help with the development and research of obesity phytotherapy. In this review, we provided information regarding plant species along with their mode of action used for the effective treatment of obesity. It was revealed that the species in the catalogue had anti-obesity properties, including actions to slow down the absorption of fat, reduce enzymatic activity, mediate lipid levels, and boost the effects of lipolysis, which were primarily linked to phenolic compounds. For species with phenolic compounds in their chemical components, more thorough botanical, chemical, pre-clinical, and clinical research are especially required. The safe therapy for obesity may involve taking standardised medicinal plant extracts. The effectiveness of some plant combinations for medical purposes, however, may be reduced, and they may also have unanticipated negative effects.

Key words: obesity; therapeutic plants; anti-obesity mechanism; weight loss; dietary supplements

Introduction

The increasing intake of high-calorie meals is the primary cause of obesity, which is regarded as a global epidemic as well as an energetic imbalance. Inactivity, environmental and social changes, particularly those affecting bargaining power and education levels, as well as the impact of others on food consumption are additional contributors [1-4]. Diabetes, osteoarthritis, dyslipidaemias, and musculoskeletal problems, including endometrial, breast, and colon cancer, are all linked to obesity [5]. Additionally, clinically apparent cardiac risk factors associated with obesity include hypertension, glucose intolerance, insulin resistance, and a high body mass index [6, 7]. Since 1980, the rates of morbidity and death have risen [8,9], making them a social issue that has attracted institutional and governmental attention [10]. Children under five who were obese numbered close to 42 million in 2013. In 2014, there were approximately than 1.9 billion overweight individuals, of whom and over 600 million were obese.

Correct diagnosis is essential to selecting the optimal course of treatment for obesity [11]. There are many integrative and complementary therapies, including diet plans, exercise, surgery, behavioural therapy, lifestyle changes, and medication-assisted treatments for hypnosis, drug addiction, acupuncture, or the utilisation of therapeutic plants [12, 13]. Because they are non-invasive, pharmacological approaches are advised for the obese person's treatment. Medications such as sibutramine, fluoxetine, sertraline, orlistat, and topiramate are among those that are advised [14]. However, since they could exacerbate the clinical picture in people with cardiovascular problems, these should be used with extreme caution.

Many people turn to alternative remedies when conventional medical treatments for chronic conditions are ineffective and ultimately dangerous. Plant-based medicines that may promote satiety, a quicker pace of weight reduction, and a higher metabolism are included in these treatments. Currently, dietary supplement-based weight loss treatments are common, indicating that ethno pharmacology & phytotherapy may be effective weight loss and preventive methods.

Plants are used medicinally because of ethno botanical and ethno pharmacological research that examines their potential for curing and preventing a wide range of illnesses. These methods draw on common knowledge, hence the conventional has grown in significance to science. Such methods also aid in the choice of study species & the creation of phototherapeutics drugs based upon ethno pharmacological research [15, 16].

In this respect, species of plants have evolved crucial for producing isolated & extract chemical components that are the basis for the creation of medicines for obesity. To ensure solid, secure, and dependable outcomes, all the factors that identify a plant as an unconventional treatment option for the treatment of illnesses must be systematically evaluated or the creation of treatment solutions, which take into consideration the cultural, social, environmental, & economic disparities between nations, evidence-based public policies, must be developed. Setting constraints for that goal and fostering knowledge exchange amongst producers, researchers, developers, and businesses are both facilitated by translational research.

Based upon the aforementioned factors, Species of plants are listed in this study which have been ethno pharmacologically mentioned as prospective remedies for obesity. These plants also possess the pharmacological potential to be turned into phototherapeutic drugs. The goal is to direct future ethno pharmacological, pre-clinical, and clinical research in the pursuit of therapeutic alternative treatments and the advancement of public health.

Anti-obesity mechanism of therapeutic plants

1. Inhibition of enzymes

Treatment for obesity has included targeting the inhibition of dietary fat breakdown and absorption. In order for triglycerides to be broken down into mono & diglycerides and smaller fatty acids that the body can absorb, it is known that the most significant enzyme, known as PL (Pancreatic Lipase), is involved. Researchers and medical professionals agree that a PL inhibitor can lessen fat breakdown, which in turn reduces fat assimilation and absorption. In obese patients, this can simulate a reduction in calorie consumption and aid in preventing further weight gain.

Due to research showing that obese people have higher levels of lipoprotein lipase (LPL), the therapy of obesity has also included targeting this enzyme. As LPL catalyses the dissolution of blood triglycerides to release free fatty acids (FFA), which increases the buildup of triglyceride in adipose tissue, suppression of LPL is envisaged to lower assimilation of FFA and assist in the control of obesity [43]. Treatment for type 2 diabetes mellitus is mostly focused on inhibiting the enzymes responsible for metabolism and digesting of carbohydrates. Because carbs make up the majority of calories consumed by humans in their meals, it could also be taken into account and relevant in study on obesity. These enzyme inhibitors reduce postprandial hyperglycemia by slowing down carbohydrate metabolism, which delays hydrolysis of glucose to triacylglycerol in adipose tissue [44].

2. Inhibition of adipogenesis

The primary energy reserve in both humans and animals is called white adipose tissue (WAT), and this is where extra energy is kept in the form of triglycerides. The equilibrium of such a process determines how well energy intake and output are balanced, which is known as metabolic homeostasis and regulates body weight. Rapid weight gain has been caused by an imbalance in energy consumption and energy expenditure. In contrast to peripheral tissues like the muscles & adipose tissue, the centralized nervous system, especially the hypothalamus, controls and coordinates energy consumption and expenditure. It has been suggested that a sophisticated network of both long- and short-term signals controls how much energy is consumed. These signals, which include neuropeptides that regulate hunger and metabolism known as orexigenic and anorexigenic neuropeptides, are absorbed by the hypothalamus [45, 46].

Triacylglycerols are recruited to make up for the shortage of energy during periods of energy restriction or hunger. One of the main causes of the predominance of obesity in the modern society is believed to be an overabundance of WAT [47]. The process of forming additional adipocytes from precursor cells, which leads to an increase in the volume of the adipocyte, is known to be involved in the expansion of adipose tissue. The development of anti-obesity-associated bioactivities has been linked to therapies that control adipocyte size and number, expression of signals related to energy balance, and inhibition or increase of particular adipokines [48].

3. Appetite suppression

In order to create long chain fatty acids from acetyl coenzyme A and malonyl-CoA, fatty acid synthase (FAS) is known to catalyse a reductive reaction. It has been demonstrated that FAS inhibition can lower food consumption & body mass in mice given FAS inhibitors. As a result, FAS inhibition is a prospective treatment goal to reduce appetite & promote lose a lot of weight [49].

Numerous plants & the compounds they produce have been demonstrated to inhibit FAS, which has a detrimental effect on appetite. Green tea's epigallocatechin gallate was discovered to be a potent inhibitor of chicken liver FAS by both irreversible slow binding and reversible quick binding. Similar to known FAS inhibitors like cerulenin and the synthetic FAS inhibitor C75, the inhibitory effects were equivalent to those of these substances [50].

Medicinal plants with anti-obesity activity

In medicine and as nutritional supplements, natural plant compounds are frequently used. Natural products are nearly as old as living itself because they have been used from the beginning of human civilization on this planet. Recent years have seen a significant increase in interest in dietary phytochemicals as potential treatments for weight loss and health enhancement. Natural compounds have long been a prolific source for the development of new medications due to their diversity in chemical composition and capacity to act on a variety of biological targets, and these drugs are used in the majority of alternative and complementary systems. Plant medicines with numerous phytochemical combinations may have a synergistic impact by acting on many biological targets, providing benefits above therapies that just use one component. The following table represent anti-obesity potential of some medicinal plants with their mechanism of action.

Medicinal Plants	Anti-obesity mechanism	References
Green tea	It plays it mechanism by preventing the activity of pancreatic lipase	[17]
Jasmine tea	It plays it mechanism by preventing the activity of pancreatic lipase	[18]
Oolong tea	It plays it mechanism by preventing the activity of pancreatic lipase	[19]
Mate tea	It plays it mechanism by preventing the activity of pancreatic lipase	[20]
Levan	It plays it mechanism by preventing the activity of pancreatic lipase	[21]
Chitosan	It plays it mechanism by preventing the activity of pancreatic lipase	[22]
Soybean	It plays its anti-obesity potential by enhancing thermogenesis	[23]
Bitter orange	It plays its anti-obesity potential by enhancing thermogenesis	[24, 25]
Sea weed	It plays its anti-obesity potential by enhancing thermogenesis	[26, 27, 28]
Hoodia gordonii	It plays anti-obesity mechanism by decreasing appetite	[29]
Ginseng	It plays anti-obesity mechanism by decreasing appetite	[30]
Pomegranate leaf	It plays anti-obesity mechanism by decreasing appetite	[31]
Pine nut	It plays anti-obesity mechanism by decreasing appetite	[32]
Cinnamon	It plays its anti-obesity potential by increasing the mechanism of lipids	[33]
Herb teas	It plays its anti-obesity potential by increasing the mechanism of lipids	[34]

Black soybean	It functions as an anti-obesity strategy by blocking adipocyte differentiation	[35]
Flaxseed	It functions as an anti-obesity strategy by blocking adipocyte differentiation	[35]
Garlic	It functions as an anti-obesity strategy by blocking adipocyte differentiation	[36]
Brown algae	It functions as an anti-obesity strategy by blocking adipocyte differentiation	[37]
Banana leaf	It functions as an anti-obesity strategy by blocking adipocyte differentiation	[38, 39]
Palm oil	It functions as an anti-obesity strategy by blocking adipocyte differentiation	[40]
Capsicum	It functions as an anti-obesity strategy by blocking adipocyte differentiation	[41]
Turmeric	It functions as an anti-obesity strategy by blocking adipocyte differentiation	[42]

Table: Medicinal plants with anti-obesity mechanism

Conclusions

According to several in vivo investigations on the effectiveness of anti-obesity herbal remedies, they might work by promoting thermogenesis, reducing lipogenesis, boosting lipolysis, stifling appetite, and lowering lipid absorption. Different outcomes may result from using isolated or combined anti-obesity medicinal plant remedies. In conclusion, consuming single medicinal plants through food may be more safe and effective than consuming concoctions made from multiple medicinal plants. These results corroborate the advice of health organisations to regularly consume vegetables and particular herbs like curcumin, capsicum, ginger, & green tea. It is important to keep raising awareness of anti-obesity medication use and enticing obese people to take it, along with an improved exercise routine & a nutritious diet. Further research in the fields of chemistry, biology, and medicine is required to determine whether some medicinal plants, especially which are used as spices & condiments, can reduce and treat human obesity. Such anti-obesity information would be helpful for food & medication producers when novel goods are produced, as well as for governments in regulating food stuffs as a strategy to encourage and improve public health.

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