World Journal of Current Medical and Pharmaceutical Research
Content available at www.wjcmpr.com ISSN: 2582-0222

GREEN MEDICINE FOR WEIGHT MANAGEMENT: MEDICINAL PLANTS AS PROMISING CURATIVE AGENTS IN THE TREATMENT OF OBESITY

K. Jeevana*, S. Kalpana, M. Sirisha
Department of Pharmacology, Sri Venkateswara College of Pharmacy, Chittoor, Andhra Pradesh, India

Article History
Received on: 28-08-2023
Revised on: 19-09-2023
Accepted on: 09-10-2023

Abstract

Obesity has become a global health crisis with substantial implications for public health. In the past 50 years, significant advancements have been made in the treatment of disorders like hypertension, adult-onset diabetes, and increased cholesterol that are directly related to obesity. However, the disease of obesity has proven to be mostly resistant to treatments, and anti-obesity drugs (AOMs) frequently have questionable safety and poor efficacy. Here, we give a summary of the history of AOM development with an emphasis on the lessons learned and current challenges. The search for next-generation AOMs that look capable of safely accomplishing significant and sustained body weight loss is motivated by recent developments, including improved knowledge of the molecular gut-brain communication. The exploration of medicinal plants for their anti-obesity potential has gained momentum due to their perceived safety and cultural acceptance.

Keywords: Medicinal plants, anti-obesity, herbal remedies, obesity management, natural interventions, traditional medicine, herbal supplements.

***Corresponding Author**
K. Jeevana
Department of Pharmacology
Sri Venkateswara College of Pharmacy
Chittoor, Andhra Pradesh, India

DOI: https://doi.org/10.37022/wjcmpr.v5i5.298

Introduction

Obesity is a complex metabolic disorder characterized by excessive accumulation of body fat, posing a significant risk to health. Traditional and complementary medicine, including the use of medicinal plants, has emerged as an alternative approach for combating obesity [1]. This review provides an overview of the role of medicinal plants in addressing obesity and related conditions.

Increased access to calorie-dense foods and decreased physical activity are well-known environmental variables contributing to the sharp rise in worldwide obesity. Chronic stress, circadian dyssynchrony, sleep deprivation, the use of anti-epileptic and psychiatric medications, and lack of sleep all contribute to weight gain [2, 3]. There is a significant interaction between genetic and environmental factors that affect BMI variation. with a heritability of between 40 and 70 percent the hereditary component of BMI contributes at a rate similar to that reported for Tourette syndrome (58-77%). breast cancer (25–56%), heart problems (34-53%), or psoriasis (66%) [4].

The antiobesity potential of medicinal plants has been an area of increasing interest in recent years. Researchers have been exploring various medicinal plants and their bioactive compounds in order to identify potential treatments for obesity. This pursuit is driven by the need for safe and effective antiobesity drugs, as the development of novel pharmaceutical options has proven challenging due to side effects and lower efficacy [5]. One approach to finding alternative treatments for obesity is through the study of traditional medicinal plants. These plants have been used for centuries in traditional medicine systems and have a long history of safety and efficacy. Furthermore, the use of medicinal plants as a natural source for treating obesity offers several advantages over modern medicines [6]. Firstly, medicinal plants generally have milder responses compared to modern medicines. This means that they may have fewer or less intense side effects, making them a safer option for long-term use. Secondly, medicinal plants are more affordable compared to modern medicines. This affordability can make them more accessible to a larger population and could potentially be used on a global scale in preventing and treating obesity. In recent years, there has been a growing interest in exploring the antiobesity potential of medicinal plants.

Mechanisms of Action

Medicinal plants used for their anti-obesity potential exert their effects through various mechanisms, including:

- Appetite suppression: Certain plants and compounds can reduce appetite, leading to decreased caloric intake.
- Lipid metabolism modulation: Some plants help regulate lipid metabolism, promoting fat breakdown and utilization.
- Thermogenesis: Certain herbal remedies stimulate thermogenesis, increasing energy expenditure.
- Hormonal regulation: Medicinal plants can affect hormones involved in appetite and metabolism regulation, such as leptin and ghrelin [7].

The role of medicinal plants in treating obesity is a subject of growing interest in both traditional and modern medicine. Medicinal plants offer a natural and potentially effective approach to managing obesity and its associated health risks. Here are several ways in which medicinal plants can play a role in treating obesity:

- **Appetite Suppression:** Many medicinal plants contain bioactive compounds that can help suppress appetite. For example, extracts from plants like *Garcinia cambogia*, *Hoodia*, and *Caralluma fimbriata* have been studied for their appetite-reducing effects. These compounds may work by influencing the brain's hunger and satiety signals, leading to reduced caloric intake.
- **Metabolism Regulation:** Some medicinal plants can modulate metabolic processes, potentially leading to weight loss. Green tea, for instance, contains catechins that are believed to increase fat oxidation and energy expenditure. Other herbs, such as ginger and cayenne pepper, can boost metabolism and help burn calories more efficiently.
- **Fat Absorption Inhibition:** Certain plants contain compounds that inhibit the absorption of dietary fats in the digestive tract. Psyllium husk, for example, is a plant-based fiber that can bind to dietary fats and reduce their absorption. This can lead to a decrease in calorie intake and fat accumulation.
- **Blood Sugar Control:** Medicinal plants like cinnamon and fenugreek have been studied for their ability to improve insulin sensitivity and regulate blood sugar levels. Better blood sugar control can help prevent weight gain and obesity-related complications [8].
- **Thermogenesis Stimulation:** Some herbs, such as capsaicin from chili peppers, can stimulate thermogenesis, which is the production of heat in the body. This process can increase energy expenditure and contribute to weight loss.
- **Anti-Inflammatory Effects:** Chronic inflammation is associated with obesity and related conditions. Medicinal plants with anti-inflammatory properties, such as turmeric and ginger, may help reduce inflammation and improve metabolic health.
- **Fat Mobilization:** Certain herbs can facilitate the mobilization of stored fat, making it more accessible for energy utilization. Forskolin, derived from the Indian coleus plant, is an example of a medicinal plant that has been studied for its potential in promoting fat breakdown.
- **Hormonal Regulation:** Medicinal plants can influence hormones involved in appetite and metabolism regulation. For example, leptin and ghrelin are hormones that play roles in hunger and satiety. Some plants may help balance these hormones.
- **Psychological Benefits:** Aromatherapy using essential oils from medicinal plants like lavender or peppermint may help reduce stress, anxiety, and emotional eating, which can contribute to obesity.
- **Supporting Lifestyle Changes:** Medicinal plants can complement lifestyle changes, including diet and exercise, by providing additional support for weight management. Herbal teas and supplements are often used in combination with healthy lifestyle choices [9].

Efficacy of Medicinal Plants

Numerous medicinal plants have demonstrated promising anti-obesity effects in both animal models and human studies (Table 1). Notable examples include:

1. ***Garcinia Cambogia* (Hydroxycitric Acid - HCA):** *Garcinia cambogia*, a tropical fruit, has been extensively studied for its potential to inhibit fat synthesis and reduce appetite due to its high content of hydroxycitric acid (HCA). Research suggests that HCA may help decrease body weight and fat mass in both animal and human studies. However, results have been mixed, and more research is needed to establish its efficacy [10].
2. **Green Tea (*Camellia sinensis*):** Green tea, rich in catechins, particularly epigallocatechin gallate (EGCG), has been investigated for its thermogenic and fat oxidation properties. Studies have shown that green tea extracts can help increase energy expenditure and fat oxidation, potentially contributing to weight loss and improved metabolic health [11].
3. **Cinnamon (*Cinnamomum verum*):** Cinnamon has been studied for its ability to improve insulin sensitivity and regulate blood sugar levels. While it may not directly cause weight loss, better blood sugar control can prevent further weight gain and obesity-related complications, making it a potential adjunct in obesity management [12].
4. **African Mango (*Irvingia gabonensis*):** African mango extract has gained attention for its potential to reduce body weight and improve metabolic parameters. Some studies have suggested that it may help reduce fat mass, lower cholesterol levels, and improve insulin sensitivity [13].
5. **Ginger (*Zingiber officinale*):** Ginger contains bioactive compounds with thermogenic and anti-inflammatory properties. Research has shown that ginger supplementation may lead to modest reductions in body weight and improve metabolic markers in individuals with obesity [14].
6. **Forskolin (*Coleus forskohlii*):** Forskolin, derived from the Indian coleus plant, has been investigated for its ability to promote the breakdown of stored fat and increase lean body mass. Some studies have shown promising results, although more research is needed to confirm its efficacy [15].
7. **Psyllium Husk:** Psyllium husk, a soluble fiber derived from the *Plantago ovata* plant, has been studied for its

8. potential to reduce appetite and inhibit fat absorption. It may help with weight management by increasing feelings of fullness and reducing calorie intake [16].
9. **Turmeric (*Curcuma longa*):** Turmeric contains curcumin, known for its anti-inflammatory properties. While not a direct weight loss agent, curcumin may help reduce inflammation associated with obesity and improve metabolic health [17].
10. ***Hoodia gordonii*:** Hoodia is a succulent plant traditionally used for appetite suppression by indigenous populations in Southern Africa. While it gained attention as a potential appetite suppressant, research has been limited, and more studies are needed to confirm its efficacy [18].
10. **Bitter Orange (*Citrus aurantium*):** Bitter orange contains synephrine, a compound believed to increase metabolic rate and energy expenditure. Research has shown that bitter orange extract may have thermogenic and appetite-suppressing effects, making it a subject of interest in weight management [19].
11. **Ginseng (*Panax ginseng*):** Ginseng is known for its adaptogenic properties and has been studied for its potential to improve energy levels and reduce fatigue. While not a direct weight loss agent, it may indirectly support weight management by enhancing physical endurance and vitality [20].
12. **Hibiscus (*Hibiscus sabdariffa*):** Hibiscus tea has gained attention for its potential role in weight management. Some studies suggest that hibiscus extract may help reduce body weight and improve metabolic parameters, possibly through its antioxidant and diuretic effects [21].
13. **Aloe Vera (*Aloe barbadensis*):** Aloe vera is known for its laxative properties, and some research has explored its potential in weight loss. It may help with temporary weight reduction through its cleansing effects on the digestive system [22].
14. **Nettle (*Urtica dioica*):** Nettle leaf extract has been investigated for its ability to modulate appetite and blood sugar levels. While not a widely studied anti-obesity remedy, it may have potential in supporting metabolic health [23].
15. ***Gymnema sylvestre*:** Gymnema is known as the "sugar destroyer" due to its traditional use in reducing sugar cravings. Some research has suggested that gymnema extracts may help control appetite and reduce sugar intake, which could be beneficial in obesity management [24].
16. **Guarana (*Paullinia cupana*):** Guarana is rich in caffeine and has been studied for its potential thermogenic and appetite-suppressing effects. It may help increase energy expenditure and reduce appetite [25].
17. **Dandelion (*Taraxacum officinale*):** Dandelion leaf extract has diuretic properties and may help with temporary weight loss through water loss. It has also been used in traditional medicine for digestive support [26].
18. **Chickweed (*Stellaria media*):** Chickweed has been traditionally used as a mild appetite suppressant. Some herbal formulations for weight management include chickweed due to its potential to reduce cravings [27].
19. **Chromium Picolinate:** While not a plant per se, chromium is a trace mineral that has been studied for its potential to improve insulin sensitivity and regulate blood sugar levels. It may indirectly support weight management by helping to control appetite and blood sugar spikes.
20. **Herbal Combinations:** Some studies have explored the synergistic effects of herbal combinations in obesity management. Herbal formulations that combine multiple plant extracts may offer enhanced anti-obesity effects.

Table 1: List of few Medicinal plants researched for Anti-Obesity activity

Medicinal Plant	Research Work on Obesity	Key Research Findings on Obesity
Garcinia cambogia	Research suggests that hydroxycitric acid (HCA) in *Garcinia cambogia* may inhibit fat accumulation and reduce appetite [10]	A randomized controlled trial found that hydroxycitric acid (HCA) from *Garcinia cambogia* had no significant effect on weight loss compared to a placebo group. Further studies have yielded mixed results.[10]
Green Tea (*Camellia sinensis*)	Green tea catechins, particularly EGCG, have been studied for their potential to enhance fat oxidation and metabolic rate.[11]	Numerous studies suggest that the catechins in green tea, particularly EGCG, may enhance thermogenesis, fat oxidation, and weight loss when combined with a calorie-restricted diet and exercise.[11]
Ginger (*Zingiber officinale*)	Ginger has shown thermogenic properties and appetite-suppressing effects in some studies.[14]	Ginger has shown thermogenic properties and appetite-suppressing effects in some small studies, but more research is needed to confirm its effectiveness for obesity management.[14]
Cinnamon (*Cinnamomum verum*)	Cinnamon may help regulate blood sugar levels, which can impact weight management. [12]	Some studies suggest that cinnamon may help regulate blood sugar levels and reduce insulin resistance, potentially supporting weight management.[12]
Fenugreek (*Trigonella foenum-graecum*)	Fenugreek seeds' soluble fiber content may promote satiety and reduce calorie intake.[28]	Fenugreek seeds' soluble fiber content may promote feelings of fullness and reduce calorie intake. Limited clinical trials have shown positive effects on weight management.[28]
Guggul (*Commiphora wightii*)	Guggul has been investigated for its potential to improve lipid metabolism and aid in weight management in some research.[28]	Animal studies have indicated that guggul may improve lipid metabolism and reduce body weight. However, more human studies are needed to confirm these effects in humans.[28]

Aloe Vera (*Aloe barbadensis* miller)	*Aloe vera* gel has shown potential for weight loss and reducing body fat in animal studies.[22]	Some animal studies have suggested that *Aloe vera* gel may reduce body fat and body weight, possibly by improving lipid metabolism.[22]
Turmeric (*Curcuma longa*)	Curcumin, the active compound in turmeric, has anti-inflammatory properties and may influence metabolism.[17]	Curcumin, the active compound in turmeric, has anti-inflammatory properties and may influence metabolism. Some studies suggest a potential role in weight management, but more research is needed.[17]
Bitter Orange (*Citrus aurantium*)	Bitter orange extract, containing synephrine, has been studied for its potential thermogenic and appetite-suppressing effects.[19]	Bitter orange extract, containing synephrine, has been studied for its potential thermogenic and appetite-suppressing effects. However, safety concerns have been raised, and further research is warranted.[19]
Cayenne Pepper (*Capsicum annuum*)	Capsaicin in cayenne pepper may boost metabolism and reduce appetite in some research.[10]	Capsaicin in cayenne pepper may boost metabolism and reduce appetite in some studies. However, the effects are generally modest and may vary among individuals.[17][18]

It's essential to emphasize that the efficacy and safety of these medicinal plants can vary, and more research is needed to confirm their benefits for obesity treatment. Additionally, individual responses may differ, and it's advisable to consult with a healthcare professional before using herbal remedies or supplements for weight management. A comprehensive approach to obesity treatment typically includes lifestyle modifications, dietary changes, physical activity, and medical guidance [29].

Safety Considerations

In general, medicinal plants used for anti-obesity purposes are considered safe when consumed in moderation. However, individual reactions and potential interactions with medications should be considered. Some herbal supplements may have mild side effects, such as gastrointestinal discomfort [30].

Challenges and Future Prospects

While medicinal plants show promise in anti-obesity interventions, several challenges remain:

- Standardization: Herbal preparations can vary in potency and quality, necessitating standardized formulations for reliable results [31].
- Clinical Evidence: More high-quality clinical trials are needed to validate the efficacy and safety of medicinal plants for obesity management.
- Regulation: Improved regulation and quality control are essential to ensure the safety and consistency of herbal products [32].

Future Directions

Future research should focus on:

- Conducting rigorous clinical trials to validate the efficacy and safety of medicinal plants.
- Investigating potential synergistic effects of herbal combinations.
- Exploring the mechanisms of action of lesser-known medicinal plants.
- Developing evidence-based guidelines for the integration of medicinal plants into obesity management strategies.

Conclusion

Medicinal plants offer a natural and culturally accepted approach to address the global obesity epidemic. While the efficacy of various plants and compounds is promising, further research, including well-designed clinical trials, is needed to establish their role in obesity management. Additionally, collaboration between traditional medicine and modern healthcare systems can provide holistic approaches to combat obesity.

Conflicts of Interest

The Authors declare no conflicts of interest.

References

1. Ghaben, A. L., and Scherer, P. E. (2019). Adipogenesis andmetabolic health. Nat. Rev. Mol. Cell Biol. 20 (4), 242–258.
2. Ikeda, K., and Yamada, T. (2020). UCP1 dependent and independent thermogenesis in Brown and beige adipocytes. Front. Endocrinol. (Lausanne) 11, 498.
3. Lin, X., and Li, H. (2021). Obesity: Epidemiology, pathophysiology, and therapeutics. Front. Endocrinol. (Lausanne) 12, 706978.
4. Raoof, G. F. A., and Kareem, A.M. Z. A. E. (2020). The golden role of natural products in obesity. Int. J. Pharma Res. Health Sci. 8 (6), 3248–3255.
5. Zhang, Y., Fan, S., Hu, N., Gu, M., Chu, C., Li, Y., & Xiong, L. (2012). Rhein Reduces Fat Weight indb/dbMouse and Prevents Diet-Induced Obesity in C57Bl/6 Mouse through the Inhibition of PPARγ Signaling. https://scite.ai/reports/10.1155/2012/374936.
6. Zhuoyue, Z., Ruangaram, W., & Kato, E. (2021). Saponins are responsible for the anti-obesogenic activity of *Acacia concinna*. https://scite.ai/reports/10.1007/s11418-021-01530-0.
7. Aipire, A., Mahabati, M., Cai, S., Wei, X., Yuan, P., Aimaier, A., et al. (2020). The immunostimulatory activity of polysaccharides from *Glycyrrhiza uralensis*. PeerJ 8, e8294.
8. Bolin, A. P., Sousa-Filho, C. P. B., Dos Santos, G. T. N., Ferreira, L. T., de Andrade, P. B. M., Figueira, A. C. M., et al. (2020). Adipogenic commitment induced by green tea

polyphenols remodel adipocytes to a thermogenic phenotype. J. Nutr. Biochem. 83, 108429.
9. Feng, S., Reuss, L., and Wang, Y. (2016). Potential of natural products in the inhibition of adipogenesis through regulation of PPARγ expression and/or its transcriptional activity. Molecules 21 (10), 1278.
10. Heymsfield, S.B., et al. (1998). *Garcinia cambogia* (hydroxycitric acid) as a potential antiobesity agent: A randomized controlled trial. JAMA, 280(18), 1596-1600.
11. Hursel, R., et al. (2009). The effects of green tea on weight loss and weight maintenance: A meta-analysis. International Journal of Obesity, 33(9), 956-961.
12. Khan, A., et al. (2003). Cinnamon improves glucose and lipids of people with type 2 diabetes. Diabetes Care, 26(12), 3215-3218.
13. Gadde, K. M., and Atkins, K. D. (2020). The limits and challenges of antiobesity pharmacotherapy. Expert Opin. Pharmacother. 21 (11), 1319–1328.
14. Khandouzi, N., Shidfar, F., Rajab, A., Rahideh, T., Hosseini, P., and Mir Taheri, M. (2015). The effects of ginger on fasting blood sugar, hemoglobin a1c, apolipoprotein B, apolipoprotein a-I and malondialdehyde in type 2 diabetic patients. Iran. J. Pharm. Res. IJPR 14 (1), 131–140.
15. Kumar, A., Sundaram, K., Teng, Y., Mu, J., Sriwastva, M. K., Zhang, L., et al. (2022). Ginger nanoparticles mediated induction of Foxa2 prevents high-fat diet-induced insulin resistance. Theranostics 12 (3), 1388–1403.
16. Kwan, H. Y.,Wu, J., Su, T., Chao, X. J., Liu, B., Fu, X., et al. (2017). Cinnamon induces browning in subcutaneous adipocytes. Sci. Rep. 7 (1), 2447.
17. Mansour, M.S., et al. (2012). Ginger consumption enhances the thermic effect of food and promotes feelings of satiety without affecting metabolic and hormonal parameters in overweight men: A pilot study. Metabolism, 61(10), 1347-1352.
18. Neelakantan, N., et al. (2014). Effect of fenugreek (*Trigonella foenum-graecum* L.) intake on glycemia: A meta-analysis of clinical trials. Nutrition Journal, 13, 7.
19. Sharma, B., et al. (2018). Anti-obesity effect of Commiphora wightii in high-fat diet induced obese rats. Physiology & Behavior, 188, 79-85.
20. Jeong, E., et al. (2017). Aloe vera gel extract attenuates ethanol-induced hepatic lipid accumulation by suppressing the expression of lipogenic genes in mice. Phytotherapy Research, 31(8), 1247-1253.
21. Chuengsamarn, S., et al. (2014). Curcumin extract for prevention of type 2 diabetes. Diabetes Care, 35(11), 2121-2127.
22. Stohs, S.J., et al. (2012). A review of the human clinical studies involving Citrus aurantium (bitter orange) extract and its primary protoalkaloid p-synephrine. International Journal of Medical Sciences, 9(7), 527-538.
23. Janssens, P.L., et al. (2013). Acute effects of capsaicin on energy expenditure and fat oxidation in negative energy balance. PLoS ONE, 8(7), e67786.
24. Lee, H. E., Yang, G., Han, S. H., Lee, J. H., and Jang, J. K., (2018). Anti-obesity potential of Glycyrrhiza uralensis and licochalcone A through induction of adipocyte browning. Biochem. Biophysical Res. Commun. 503 (3), 2117–2123.
25. Huang, L., Zhang, J., Zhu, X., Mi, X., Li, Q., Gao, J., et al. (2021). The phytochemical rhein mediates M(6)a-independent suppression of adipocyte differentiation. Front. Nutr. 8, 756803.
26. Latha, B. P., (2011). Therapeutic efficacy of Achyranthes aspera saponin extract in high fat diet induced hyperlipidaemia in male wistar rats. Afr. J. Biotechnol. 10 (74), 17038–17042.
27. Li, R., Lan, Y., Chen, C., Cao, Y., Huang, Q., Ho, C. T., et al. (2020). Anti-obesity effects of capsaicin and the underlying mechanisms: A review. Food & Funct. 11 (9), 7356–7370.
28. Tucci, S. A. (2010). Phytochemicals in the control of human appetite and body weight. Pharm. (Basel) 3 (3), 748–763.
29. Jain, S., and Singh, S. N. (2013). Metabolic effect of short term administration of Hoodia gordonii, an herbal appetite suppressant. South Afr. J. Bot. 86, 51–55.
30. Hasani-Ranjbar, S., Jouyandeh, Z., and Abdollahi, M. (2013). A systematic review of anti-obesity medicinal plants - an update. J. Diabetes Metabolic Disord. 12, 28.
31. Zhang, Y., and Huang, C. (2012). Targeting adipocyte apoptosis: A novel strategy for obesity therapy. Biochem. biophysical Res. Commun. 417 (1), 1–4.
32. Spiegelman, B. M. (2013). Banting lecture 2012: Regulation of adipogenesis: Toward new therapeutics for metabolic disease. Diabetes 62 (6), 1774–1782.