REVIEW ARTICLE

Herbal Interventions for Obesity: A Review of Unani Medicinal Herbs

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ABSTRACT

World Health Organization (WHO) defines obesity and overweight as excessive or aberrant fat accumulation that poses an increased health risk. Despite this oversimplified definition, obesity is a complex illness caused by a persistently positive energy balance, or when dietary energy intake surpasses energy expenditure. Extra energy is transformed into triglycerides, which are then stored in depots of adipose tissue that enlarge, resulting in weight gain and an increase in body fat.

The escalating global prevalence of obesity, impacting more than two billion individuals, necessitates innovative and holistic approaches in public health. This review paper aims to evaluate the potential of medicinal herbs in obesity management by systematically examining their mechanisms of action, including enzyme inhibition, appetite suppression, and modulation of metabolic processes, to propose an integrative, safer, and holistic approach to enhance current strategies for obesity treatment.

A comprehensive search of literature was conducted in PubMed, Google scholar, and Science Direct. Search was conducted using the terms - “Unani herbs”, obesity management, *Siman Mufrit.*

This review paper highlights critical evaluation of contemporary obesity management strategies, emphasizing need for safer and more sustainable alternatives. Insights from Unani medicine contribute to a holistic understanding of obesity, paving way for an exploration of medicinal herbs and their mechanisms of action. Enzyme inhibition, appetite suppression, and modulation of metabolic processes emerge as key factors in anti-obesity effects of medicinal herbs.

In conclusion, this comprehensive review underscores potential of medicinal herbs as promising contributors to global obesity management drawing insights from epidemiological data and traditional Unani medicine. By combining traditional wisdom with modern research, a more holistic and individualized approach can be achieved. The proposed integrative strategy advocates for further research, collaboration, and shift towards natural and culturally sensitive healthcare practices to address obesity. (*Altern Ther Health Med.* 2025;31(3):42-47).

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INTRODUCTION

One of the major issues in public health is the global obesity epidemic, which presently affects over 2 billion people worldwide.[1] The Framingham Cohort Study has demonstrated a direct correlation between an individual's years of being overweight or obese and an earlier chance of dying.[1] Overall mortality rises by 29% for every 5-unit increase in BMI over 25 kg/m^2. Elevated BMI cannot directly predict cardiometabolic risk; instead, measures of central adiposity, such as an increased waist circumference, do.[2] Around 13% of adults worldwide are currently considered obese, with the prevalence of obesity having nearly tripled between 1975 and 2016.[2,3] People who experience obesity are associated with higher rates of morbidity and death when compared to people with normal body weight.[4]

World Health Organization (WHO) defines obesity and overweight as excessive or aberrant fat accumulation that poses an increased health risk. Despite this oversimplified definition, obesity is a complex illness caused by a persistently positive energy balance, or when dietary energy intake surpasses energy expenditure. Extra energy is transformed into triglycerides, which are then stored in depots of adipose tissue that enlarge, resulting in weight gain and increased body fat.[5] The most widely used indicator of being overweight is the Body Mass Index (BMI), measuring weight adjusted for height that represents total body fat.[4] Historically, BMI has been the preferred metric for determining body composition and size and diagnosing underweight and overweight. However, it has been proposed that other metrics representing abdominal adiposity, such as waist circumference, waist-hip ratio, and waist-height ratio are more effective at predicting the risk of cardiovascular diseases (CVDs) than BMI. This is primarily supported by the idea that elevated visceral adipose tissue is linked to several metabolic disorders, such as impaired insulin sensitivity, impaired glucose tolerance, and unfavorable lipid profiles, all of which are risk factors for type 2 diabetes and CVD.[6] According to the Unani system of medicine, obesity is a *Balghami* (Phlegmatic) illness, where *Khilt e Balgham* (phlegmatic humour) is predominant in the individual's body and contributes to the emergence of obesity.[7] Meanwhile, at least 5% weight loss represents a clinically significant advancement in treating obesity. The use of anti-obesity medications in conjunction with lifestyle modification (diet and exercise) is the current approach to managing obesity. Nowadays, most methods of treating obesity involve the use of synthetic chemical-based medications, which come with a high price tag. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) reports that the US Food and Drug Administration (USFDA) has approved five medications to treat obesity thus far: liraglutide, phentermine/topiramate, lorcaserin, orlistat, and naltrexone/bupropion. Significantly, orlistat, bupropion/naltrexone, and liraglutide are three medications approved by the European Medicines Agency (EMA) to treat the symptoms of obesity. As a pancreatic lipase inhibitor, orlistat decreases intestinal absorption of fat content from food; and, cholelithiasis, cholestatic hepatitis, and subacute hepatitis are infrequent side effects of this medication. Phentermine and topiramate decrease appetite, while topiramate lessens seizures and migraine headaches, therefore people who take these drugs together feel less hungry. Significant adverse effects from this combination of medications include dysgeusia (change in taste), paraesthesia (burning sensation in hands and feet), hypoesthesia (lack of sensation in a body part), constipation, dry mouth, dizziness, and concentration deficit.[8] However, the USFDA ordered the removal of lorcaserin from the market on February 13, 2020, after a clinical investigation of the drug's safety revealed an elevated risk of cancer. Orlistat, phentermine/topiramate, naltrexone/bupropion, and liraglutide are the anti-obesity drugs currently approved by the FDA for treating chronic weight loss. They are expensive and some people may experience adverse side effects. Therefore, pharmacological therapy should be started in obese people after assessing the risks and benefits.[9]

Due to these factors, globally, most people including researchers must actively look for alternative therapeutic approaches. To prevent diet-induced obesity and to promote effective weight loss, a variety of natural medicinal plants and products, diet-based therapies, crude extracts, and complex or individual bioactive plant metabolites may be safer and more effective alternatives. This review paper delves into the mechanisms of action, emphasizing enzyme inhibition, appetite suppression, and modulation of various metabolic processes.

ANTI-OBESITY EFFECTS OF MEDICINAL HERBS

According to Unani principles, blood is a combination of four Akhlat (humours) that are obtained from food after digestion: Dam (blood), Balgham (phlegm), Safra (yellow bile), and Sauda (black bile). The whole body remains healthy when these humours are balanced in the right amounts, and vice versa. The temperament of Balgham (phlegm) is Barid Ratab (cold and wet) of all the four humours. Obesity is more likely to occur in people with cold temperaments due to the pathological accumulation of cold and wet matter (fat and phlegm). According to Ibn Sina and Zakaria Razi, medications with the opposite temperament (hot and dry) to that of the person with obesity—i.e., cold and wet—should be utilised to treat obesity.[10]

The various medicinal herbs mentioned in the Unani literature for the management of obesity will be discussed in this section (Table 1).

Table 1. List of Medicinal Herbs and Their Physiological Impact

Unani Name	Botanical Name	Common Name	Activities	Chemical Constituents	Part used
Anisoon[11-21]	*Pimpinella anisum Linn.*[11-21]	Aniseed[11-21]	Carminative, Diuretic, Diaphoretic, Laxative[7,11-20]	Eugenol, α-terpineol, 1,8-cineol, α-pinene, limonene, trans anethole, palmitic acid, linoleic acid, and oleic acid[21]	Seeds[21]
Anjeer[11-21]	*Ficus carica Linn.*[11-21]	Fig[11-21]	Catabolic, Demulcent, Diuretic, Hypoglycemic, Laxative[7,11-20]	hydroxybenzoic acids, hydroxycinnamic acids, flavonoids, coumarins, furanocoumarins, volatile constituents, and tri terpenoids[22]	Fruits, leaves[22]
Asaaroon[11-21]	*Asarum europium Linn.*[11-21]	Hazelwort[11-21]	Anti-inflammatory, Diuretic, Deobstructant[7,11-20]	Volatile oils and flavonoids[23]	Roots[23]
Ayaraj[7,11-20]	*Aloe barbadensis Mill.*[7,11-20]	Indian Aloe[7,11-20]	Anti-inflammatory, Hypocholesterolemic, Hypoglycemic, Demulcent, Laxative, Purgative[7,11-20]	anthraquinones, specifically aloin A, aloin B, aloenin A, aloenin B, and aloesin[24]	Leaves, stem[24]
Badyaan[7,11-20]	*Foeniculum vulgare Mill.*[7,11-20]	Fennel[7,11-20]	Anti-inflammatory, Antioxidant, Cardiotonic, Choleretic, Diaphoretic, Diuretic, Laxative, Stimulant[7,11-20]	α-Thujene 2 1,8-Cineol 3 β-Ocimene 4 Linalool 5 Germacrene D 6 Anisketone 7 Apiol 8 η-Hexadecanoic acid 9 Cubebene[25]	Shoots, leaves, stems, Seeds[25]
Balchad[7,11-20]	*Nardostachys jatamansi DC.*[7,11-20]	Musk Root[7,11-20]	Carminative, Diuretic, Laxative, Stimulant[7,11-20]	Sesquiterpenes, coumarins, and jatamansone[26]	Rhizomes[26]
Chirchita[7,11-20]	*Achyranthes aspera Linn.*[7,11-20]	Chaff-flower[7,11-20]	Diuretic, Hypoglycemic, Hypotensive Hepatoprotective, Hypolipidemic[7,11-20]	Alkaloids, saponins, glycosides, steroids, niacin, ascorbic acid, behenic acid, and other fatty acids and esters,[14,15] essential oil and terpenoids[27]	Leaves, fruits, roots[27,28]
Dhaniya[7,11-20]	*Coriandrum sativum Linn.*[7,11-20]	Coriander[7,11-20]	Diuretic, Hypoglycemic, Hypotensive Laxative, Lipolytic, Stimulant[7,11-20]	Flavonoids, phenolic acids, essential oil, and fatty oil. Sterols, terpenoids, and tocols[29]	All parts are edible[29]

Table 1. (continued)

Filfil[7,11-20]	*Piper nigrum Linn.*[7,11-20]	Black pepper[7,11-20]	Antioxidant, Diuretic, Hypotensive, Hypocholesterolemic, Stimulant[7,11-20]	α-pinene, sabinene, β-pinene, δ-3-carene, limonene, and β-caryophyllene[30]	Dried fruits[30]
Fitra Saliyoon[7,11-20]	*Petroselinum crispum (Mill.) Airy-Shaw*[7,11-20]	Parsley[7,11-20]	Anti-inflammatory, Carminative, Diuretic[7,11-20]	Apiol,[18] myrcene, 1,3,8-p-menthatriene, myristicin, β-phellandrene, and other terpenoids[31]	Seeds[31]
Gandana[7,11-20]	*Allium ascalonicum Linn.*[7,11-20]	Shallot[7,11-20]	Fibrinolytic, Hypocholesterolaemic[7,11-20]	furostanol saponins, flavonoids, and quercetin[32]	Bulbs of plant[32]
Haliyoon[7,11-20]	*Asparagus officinalis Linn.*[7,11-20]	Asparagus[7,11-20]	Anti-inflammatory, Diuretic, Laxative[7,11-20]	Steroidal saponins, essential oils (Asparagine, arginine, tyrosine, and flavonoids), resin and tannin[33]	Roots, fruits, leaves[33]
Halon[7,11-20]	*Lepidium sativum Linn.*[7,11-20]	Garden cress[7,11-20]	Diuretic, Laxative, Stimulant[7,11-20]	Gallic acid, coumaric acid, caffeic acid, kaempferol, and quercitrin[34]	Roots, leaves, seeds[34]
Haasha[7,11-20]	*Thymus serpyllum Linn.*[7,11-20]	Mother of thyme[7,11-20]	Diuretic, Hypotensive, Thyrotropic[7,11-20]	Germacrene thymol, carvacrol, linalool, geraniol, citral, and (E)-caryophyllene[35]	All the parts[35]
Karafs[7,11-20]	*Apium graveolens Linn.*[7,11-20]	Celery[7,11-20]	Anti-inflammatory, Antioxidant, Choleretic, Diuretic, Hypoglycemic[7,11-20]	Fatty oils with fatty acids, phthalides, and volatile oils[36]	Seeds[36]
Kasni[7,11-20]	*Cichorium intybus Linn.*[7,11-20]	Chicory[7,11-20]	Cardiotonic, Diuretic, Demulcent, Hypocholesterolemic, Hypoglycemic, Hepatoprotective[7,11-20]	Phenolic acid (chlorogenic acid), Flavonoids (Anthocyanins, flavonols, and flavanone) and polyphenols[37]	Roots, leaves, seeds[37]
Khatmi[7,11-20]	*Althaea officinalis Linn.*[7,11-20]	Marshmallow[7,11-20]	Anti-inflammatory, Demulcent, Diuretic, Deobstruent, Emollient, Hypoglycemic[7,11-20]	L-rhamnose, D-galactose, D-galacturonic acid, and D-glucuronic acid[38]	Root[38]
Kundur[7,11-20]	*Boswellia serrata Roxb ex Colebr.*[7,11-20]	Indian Olibanum[7,11-20]	Anti-inflammatory, Anti-atherosclerotic, Diaphoretic, Diuretic, Demulcent Hypotensive, and Hypoglycemic[7,11-20]	Monoterpenes(α-thujene), diterpenes, triterpenes (α- and β-amyrins), pentacyclic triterpenic acids (boswellic acids); and tetracyclic triterpenic acids (tirucall-8,24-dien-21-oic acids)[39]	Gum-resin[39]
Lehsun[7,11-20]	*Allium sativum Linn.*[7,11-20]	Garlic[7,11-20]	Anti-inflammatory, Anti-hypertensive, Antioxidant, Anti-atherogenic, Cardiotonic, Choleretic, Fibrinolytic, Diaphoretic, Hepatoprotective, Hypocholesterolemic, Hypoglycemic, Hypolipidemic[7,11-20]	Organosulfur compounds, saponins, phenolic compounds, and polysaccharides[40]	Bulbs[41]
Luk Maghsool[7,11-20]	*Laccifer lacca*[7,11-20]	Lac[7,11-20]	Anti-inflammatory, Antiobesity, Deobstruent, Hypolipidimic[7,11-20]	Aleuritic acid, Butolic acid, shellolic acid, and jalaric acid[42]	Resin[42]
Muqil[7,11-20]	*Commiphora mukul (Hook. Ex Stocks), C. wightii*[7,11-20]	Engl. Myrrh[7,11-20]	Anti-inflammatory, Antioxidant, Cardioprotective, Demulcent Hypoglycemic, Hypotriglyceridemic, Hypocholesterolemic, Lipolytic, Stimulant[7,11-20]	Diterpenoids, triterpenoids, steroids, long chain aliphatic tetrols, aliphatic esters, ferulates, lignans, and carbohydrates[43]	Oleo-gum-resin[43]
Marzanjosh[7,11-20]	*Origanum majorana Linn.*[7,11-20]	Sweet marjoram[7,11-20]	Antioxidant, Carminative, Diaphoretic, Diuretic[7,11-20]	a and b-pinene, camphene, sabinene, a- and b-phellandrene, r-cymene, limonene, b-ocimene, g-terpinene, terpinolene, a-terpinene, carvone, and citronellol[44]	Leaves[44]
Nankhwah[7,11-20]	*Trachyspermumammi (Linn.)*[7,11-20]	Bishop's weed[7,11-20]	Diuretic, Diaphoretic, Laxative, Stimulant[7,11-20]	Tannins, glycosides, fiber, saponins, flavone, thymol, p-cymene, γ-terpenine, and carvacrol[45]	Fruits, seeds[45]
Piyaaz[7,11-20]	*Allium cepa Linn.*[7,11-20]	Onion[7,11-20]	Anti-inflammatory, Anti-atherosclerotic, Antioxidant, Choleretic, Deobstruent, Diaphoretic, Diuretic, Hypotensive, Hypocholesterolemic, Hypoglycemic, Hypolipidemic, Lipolytic, Lipoxygenase[7,11-20]	Glutathione, selenium and vitamin C, quercetin, and isorhamnetin[46]	Bulb[46]
Suddab[7,11-20]	*Ruta graveolens Linn.*[7,11-20]	Garden Rue[7,11-20]	Anti-inflammatory, Antioxidant, Choleretic, Diuretic, Diaphoretic, Hepatoprotective, Hypoglycemic, Lipolytic[7,11-20]	Rutin, rutamarin, furanocoumarin, quinolinic alkaloids, dicoumarin, and long-chain ketones[47]	All parts[47]
Turbud[7,11-20]	*Operculina turpethum Linn.*[7,11-20]	Jalap[7,11-20]	Anti-inflammatory, Diuretic, Laxative, Purgative[7,11-20]	Saponins, flavonoids, glycosides, phenolics[48]	Seeds, root bark, root, stem, and leaves[48]
Zeera[7,11-20]	*Carum carvi Linn, Cuminum cyminum*[7,11-20]	Caraway[7,11-20]	Anti-inflammatory, Carminative, Choleretic, Diuretic, Stimulant[7,11-20]	Essential oils, fatty acids, tannins, alkaloids, and terpenoids[49]	Fruits[50]

ANTI-OBESITY MECHANISM OF MEDICINAL PLANTS

The possible mechanism of action of these medicinal plants will be discussed in this section.

Inhibition of Enzymes

One approach to treating obesity is inhibiting the breakdown and absorption of dietary fat. Pancreatic lipase (PL) is the most important enzyme involved in the breakdown of triglycerides into smaller fatty acids that the body can absorb such as mono and diglycerides. Experts in both research and medicine concur that a PL inhibitor can decrease fat breakdown, thus lowering the absorption and assimilation of fat. This can mimic reduced caloric intake in obese patients and help stop further weight gain.[51]

Appetite Suppression

Fatty acid synthase (FAS) is known to catalyze the reductive reaction between acetyl coenzyme A and malonyl-CoA to produce long-chain fatty acids. It has been shown that administering FAS inhibitors to mice can reduce their body mass and food intake. Therefore, a potential treatment objective to lower appetite and encourage significant weight loss is FAS inhibition.[52]

Other Mechanisms

Most medicinal plants lack clear mechanisms that prevent obesity. Nonetheless, various hypotheses have been suggested regarding these plants, including decreased pre-adipocyte differentiation and proliferation, increased energy expenditure, decreased lipid absorption, decreased energy intake, increased lipolysis, and reduced lipogenesis.[51]

Studies have indicated that the bioactive metabolites found in specific plant parts, such as phenolic compounds, flavonoids, alkaloids, glycosteroids, and fatty acids may be responsible for the anti-obesity effects of medicinal plants. Overall, the consumption of strong anti-obesity plants is typically associated with reducing inflammation, blood sugar, and oxidative stress in the human body, as well as lipid metabolism, insulin sensitivity, glucose homeostasis, and hypolipidemic effects.

Although many ancient physicians suggested that various plants hold medicinal value against obesity, only a few plants whose medicinal value against obesity have been proven scientifically (Table 2).

C. arabica L. Caffeine has been investigated as a potential thermogenic agent for body weight loss. It can alter thermogenesis by inhibiting the intracellular cyclic AMP (cAMP) destruction caused by phosphodiesterase.[53]

Table 2. Scientifically Proven Anti-Obesity Medicinal Plants

Plant species	English name	Active compound	Effects/mechanism of action	Parts used
C. arabica L.[53]	Coffee[54]	Caffeine[53]	Metabolic stimulant, thermogenic agent[53]	Beans[54]
Ephedra sinica[53]	Chinese ephedra[55]	Ephedrine[53]	Metabolic stimulant, thermogenic agent[53]	Stem[55]
Camellia sinensis L.[53]	Tea plant[56]	Epigallocatechin gallate (EGCG)[53]	Enhance fatty acid mobilization and oxidation, Promote browning markers, Inhibit adipogenesis[53]	leaves, bud, and stalk[56]
Capsicum annuum L.[53]	Pepper plant[57]	Capsaicin[53]	Stimulates thermogenesis, Enhances insulin sensitivity, and Increases fat oxidation[53]	Fruits[57]
Pinus Koraiensis[53]	Korean pine[58]	Korean pine nut-free fatty acids (FFA)[53]	Releases cholecystokinin (CCK), thus, enhancing satiety and reducing appetite[53]	Nuts[58]
Garcinia cambogia[53]	Malabar tamarind[59]	Hydroxycitric acid (HCA)[53]	Enhances 5-HTrelease[53]	Fruit[59]
Catha edulis[53]	Khat plant[53]	Cathine (D-nor-pseudoephedrine) and cathinone (1-aminopropiophenone)[53]	Increases dopamine in the brain by acting on the catecholaminergic synapses[53]	Leaves, young shoots[53]
Hoodia gordonii[53]	Bushman's hat[53]	P57 molecule (oxypregnane steroidal glycoside)[53]	Increases ATP in hypothalamic neurons[53]	Aerial parts[53]
Stellaria medium (Linn.) Vill.[53]	Chickweed[60]	Beta-carotenes, γ-linolenic acid, and phenols[53]	Inhibits pancreatic α-amylase and lipase[53]	Whole plant[53]
Achyranthes aspera[53]	Prickly chaff flower[61]	Saponins, flavonoids, and phenols[53]	Inhibits lipase and α-amylase activity[53]	Stem, leaves, and fruits[61],[62]
Nelumbo nucifera Gaertn.[53]	Lotus, water lily[63]	Megastigmanes and alkaloids such as trans-N-coumaroyltyramine, trans-N-feruloyltyramine, roemerine oxide, liriodenine, and annuionone D[53]	Inhibits lipase andα amylase activity, Suppresses adipocyte differentiation[53]	All parts[63]
Dioscorea nipponica Makino[53]	-	Saponin, sapogenins, and Phenanthrenes such as dioscin and diosgenin[53]	Suppresses blood triacylglycerol level and Inhibits fat absorption[53]	Rhizomes[64]
Glycyrrhiza uralensis[53]	Chinese licorice[65]	Licochalcone A and Glycyrrhizin[53]	Inhibits pancreatic lipase activity, and Contributes to browning of inguinal white adipose tissue[53]	Roots, rhizomes[65]
Zingiber Officinale[53]	Ginger[66]	Ginger extracts such as gingerols, shogaols, paradols, and gingerenone A[53]	-Improves insulin sensitivity and glucose uptake, -6-gingerol decreases PPARγ,C/EBPα, and FABP4 expression and increases adiponectin expression[53]	Rhizomes[66]
Trigonella foenum-graecumL.[53]	Fenugreek [67]	Steroidal sapogenins such as diosgenin, furostanol glycosides, alkaloids such as trigocoumarin, nicotinicacid, trimethyl coumarin, and trigonelline[53]	-Increases insulin release, Increases the expression of BAT signature proteins including PGC-1α, PRDM16, and UCP1 in 3T3-L1white adipocytes[53]	Seeds, leaves and stem[67]
Allium Sativa[53]	Garlic[68]	Allicin, ajoene, dithiins, allyl methyl trisulfide,diallyl sulfide, diallyldisulfide, diallyltrisulfide, and β-carolide alkaloids[53]	β-carboline alkaloid suppressed the differentiation of adipocytes[53]	Bulb[68]
Genista tinctoria[53]	Dyer's greenweed, waxen wood[69]	Genistein[53]	Reduces PPARγ and downregulated adipogenesis[53]	Whole plant[69]
Turmeric (Curcuma longa Linn)[53]	Turmeric[70]	Turmeric (Curcuma longa Linn)[53]	-Increases the plasma norepinephrine levels and the expression of the β3AR gene[53]	Rhizomes[70]

Ephedra sinica. The shrub *Ephedra sinica* has four isomers, including ephedrine. It is a sympathomimetic phenylpropylamine protoalkaloid that has thermogenic and stimulating properties. According to numerous research, it elevates energy expenditure and encourages weight loss.[53]

Capsicum annuum L. Capsaicin is the main pungent component of capsaicinoids, a group of pungent chemicals found in hot red peppers of *Capsicum annuum L*. (Capsicum frutescens). Several studies conducted in small mice have demonstrated that capsaicin and capsinoids stimulate sympathetically mediated brown adipose tissue (BAT) thermogenesis and reduce body fatness.[53]

Camellia sinensis L. Numerous research have demonstrated that consuming green tea and its derivatives enhances fat oxidation and thermogenesis. Catechins including epicatechin, epicatechin gallate, epigallocatechin, and epigallocatechin gallate are among the components of green tea extract that give it its thermogenic effect.[53]

Catha edulis. The use of Khat plant leaves for cultural chewing has long been recognized to have appetite-suppressing properties.[53]

Hoodia gordonii. Several oxypregnane glycosides were extracted from *H. gordonii*, including P57AS3, commonly referred to as P57, which is well-known for its common aglycone Hoodigogenin A (12-O-tigloyl-3,14-dihydroxy pregn-5-ene-20-one). The chemical that actively reduces appetite and increases adenosine triphosphate (ATP) in hypothalamic neurons that regulate food intake is thought to be hoodigogenin A.[53]

Korean pine nuts. The main components of Korean pine nuts are triglycerides and polyunsaturated and monounsaturated fatty acids (PUFAs and MUFAs), which contain 4% palmitic acid, 28% oleic acid, 47% linoleic acid, and 14% pinolenic acid. The release of the satiety hormone cholecystokinin (CCK) is stimulated by the consumption of Korean pine nut-free fatty acids (FFA). Since CCK delays the emptying of the stomach, it increases the feelings of fullness and decreases appetite.[53]

Garcenia cambogia. The dried fruit rind of the Southeast Asian tree *Garcinia cambogia* is the source of hydroxycitric acid (HCA), a well-liked natural medication for weight loss. The extra-mitochondrial cleavage of citrate to produce oxaloacetate and acetyl-CoA is catalyzed by HCA, a competitive inhibitor of ATP citrate lyase.[53]

Stellaria media. This species inhibits pancreatic lipase and α-amylase in a dose-dependent manner. In general, *S. media* may lessen fat accumulation in adipose tissue brought on by a high-fat diet by inhibiting both enzymes, which stops intestinal absorption of dietary fat and carbs.[53]

Achyranthes aspera. According to a study, *A. aspera's* phenols, flavonoids, and saponins can reduce weight by blocking lipases and amylases.[53]

Nelumbo nucifera. Leaves of *N. nucifera* can inhibit a) pancreatic lipases and b) the differentiation of T3-L1 preadipocytes. Alkaloids containing benzylisoquinoline, such as trans-N-coumaroyltyramine and trans-N-feruloyltyramine, appear responsible for pancreatic lipase inhibition.[53]

Dioscorea nipponica makino. From *D. nipponica*, saponins glycone and aglycone, specifically dioscin and diosgenin were extracted. Both substances showed their ability to restrict fat absorption by suppressing the elevation of triacylglycerol levels in blood in a time-dependent manner when given orally to mice in the form of maize oil.[53]

Glycyrrhiza uralensis. Licochalcone A was isolated in a study using the ethyl acetate/n-hexane fraction of the ethyl acetate extract of *G. uralensis* roots. It was later discovered that licochalcone A reversibly and non-competitively suppresses pancreatic lipase activity.[53]

Trigonella foenum-graecum. Fenugreek seed soaked in hot water dramatically reduced fasting blood glucose, triglycerides, and very low-density lipoprotein cholesterol (VLDL-C) levels in a clinical investigation involving 18 participants.[53]

Allium sativum. Several studies have examined the effects of garlic in treating hyperglycemia; findings of one of the studies revealed that garlic reduced fasting blood glucose, triglycerides, and serum fructosamine levels in 60 type 2 diabetes mellitus (T2DM) patients participating in a 4-week double-blind, placebo-controlled study.[53]

Zingiber officinale. Terpene and phenolic chemicals, namely gingerols, are identified as the main bioactive components. Mice treated with gingerol showed better insulin sensitivity, glucose uptake, and adipocyte differentiation.[53]

Curcuma longa Linn. Curcumin also referred to as diferuloylmethane, is present in it. Adipogenesis is suppressed by curcumin.[53]

FUTURE PROSPECTIVES

Incorporating Unani medicine perspectives introduces a historical and cultural dimension to the discussion, enriching our understanding of obesity as a complex, phlegmatic disease. The contemporary obesity management strategies highlight the limitations, including side effects of current pharmaceutical interventions, fostering the need for safer and more sustainable alternatives. The focus on medicinal herbs aligns with the growing demand for holistic and natural approaches in healthcare. The detailed exploration of medicinal herbs and their anti-obesity effects provides a strong foundation for considering these natural interventions. The mechanistic understanding supports the credibility of medicinal herbs as potential contributors to weight management. The discussion on medicinal herbs reveals their diverse anti-obesity mechanisms and prospects of addressing the inflammatory, glycemic, and oxidative aspects associated with the condition. This interconnected impact on various physiological processes highlights the holistic nature of herbal interventions. In-depth elucidation of bioactive metabolites, including phenolic compounds, flavonoids, alkaloids, glycosteroids, and fatty acids will connect the dots between traditional knowledge and modern science.

Food intake is influenced by hunger, satiety, and the physiological mechanisms that balance eating with internal caloric supplies and stable body weight. *Catha edulis*, *Hoodia gordonii*, *Pinus koraiensis*, and *Garcenia cambogia*, are regulate appetite. Natural α-amylase inhibitors can help lower post-prandial hyperglycemia by delaying the breakdown of carbohydrates and thus reducing glucose absorption. Lowering post-prandial hyperglycemia inhibits the formation and storage of triacylglycerol by preventing glucose absorption into adipose tissue. However, it is widely acknowledged that dietary fat cannot be directly absorbed from the intestines until it has been broken down by pancreatic lipase. Given these findings, blocking certain digestive enzymes may be a helpful treatment option for obesity. Some herbs that have been shown to work by blocking pancreatic lipase and amylase include *Stellaria medium*, *Achyranthes aspera, Nelumbo nucifera, Dioscorea nipponica makino*, and *Glycyrrhiza uralensis*. Natural products such as caffeine, ephedrine, capsaicin, and green tea have been suggested for obesity management since they may increase energy expenditure and counterbalance the metabolic rate decrease that occurs with/after weight loss.

This review paper provides insights into the active components responsible for the anti-obesity effects and paves the way for future research and targeted therapeutic intervention. However, better dosage forms, targeted drug delivery systems, and comprehensive evaluation of possible side effects need to be done.

CONCLUSION

In summary, this comprehensive review sheds light on the prospects of medicinal herbs as a promising intervention in the complex landscape of obesity management. By unraveling the mechanisms of enzyme inhibition, appetite suppression, and metabolic modulation, these herbs present themselves as valuable contributors to effective weight control.

Bridging traditional knowledge with contemporary research, this review advocates for a paradigm shift towards natural and sustainable alternatives, aligning with the evolving preferences in healthcare.

As the findings highlight the need for further research and collaboration, the proposed integrative strategy encourages rethinking of current obesity management approaches. The journey towards a more effective, personalized, and culturally sensitive solution to combat obesity continues, with medicinal herbs offering a promising path forward.

DATA AVAILABILITY
Data can be shared on request.

AUTHOR DISCLOSURE STATEMENT
The authors have nothing to declare and there is no competing interest.

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AUTHORSHIP CONTRIBUTION STATEMENT
Saliha: Writing-Original draft, Conceptualization, Review, Editing, approval. Mohammad Naseem Khan: Visualization, investigation, supervision. S.M Abbas Zaidi: Data curation, visualization. Ehsan Ahmad: visualization, validation.

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