



HERBAL MEDICINE FOR MANAGEMENT OF OBESITY

**Miss. Ankita R. Gaikwad*¹, Prof. Ankita A. Girmakar²,
Dr. Amol N. Khedkar³**

**Department of Pharmaceutical Science, Saikrupa Institute of Pharmacy, Ghargoan, Tal- Shrigonda,
Dist- Ahmednagar, Maharashtra, India 413728**

Abstract: Overweight and obesity have become a global epidemic, especially during the lockdown caused by the COVID-19 pandemic. In recent years, the potential of medicinal plants as a better and safer alternative in the treatment of obesity and overweight has attracted attention. Obesity and overweight have become a major public health problem and their incidence is increasing at an alarming rate. Obesity is one of the main types of metabolic syndrome, which causes various problems such as hypertension, diabetes, dyslipidemia and excessive accumulation of fat, Recently, the use of medicinal plants for the treatment of obesity has attracted attention.

This review was conducted to highlight the importance of medicinal plants prevalent in traditional medicine of different countries, especially in Asia, in the prevention and treatment of obesity and overweight in the post-Covid-19 global pandemic era. An ideal herbal anti-obesity product should reduce weight by 10% compared to placebo, with improvements in biomarkers such as blood pressure, lipids and glycemia without adverse effects

Keywords: -Obesity, Herbal product, Weight Management, Ayurveda, Over Weight

Introduction^[1-4]

Traditional medicine is used not only for treatment but also for prevention which is as old as humanity itself Medicinal plants used in traditional medicine have relatively little or no adverse effects and toxicity, and their uses have increased due to their availability, affordability, ease of access, and acceptable efficacy ^[1,2,3,4] According to epidemiological evidence, obesity is the most important and important cause of various metabolic diseases such as hypertension, diabetes, cardiovascular complications, asthma, arthritis, non-alcoholic fatty liver, degenerative disease, etc. overweight and obesity are the fifth leading cause of death worldwide. At least 2.8 million adults die each year from being overweight or obese. In addition, 44% of diabetes, 23% of coronary heart disease, and 7-41% of certain strains of cancer are due to overweight and obesity. According to WHO's 2008 global estimates, 1.5 billion people were obese, of which more than 200 million men and nearly 300 million women were obese. Overall, more than one in ten of the world's adult population was obese Overweight and obesity are the fifth leading cause of death worldwide. At least 2.8 million adults die each year from being overweight or obese. In addition, 44% of diabetes, 23% of coronary heart disease, and 7-41% of certain strains of cancer are due to overweight and obesity. According to WHO's 2008 global estimates, 1.5 billion people were obese, of which more than 200 million men and nearly 300 million women were obese. Overall, more than one in ten of the world's adult population was obese.

1. Material & Methods ^[5]

The manuscript includes review articles, randomized control trials, analytical studies and results compiled from various sources such as Google Scholar, Scopus, Science Direct and PubMed. The keywords used in the literature review were COVID-19, obesity, natural products, medicinal plants, overweight, body mass index and global pandemic

2. Obesity^[6,7,8]

It has been reported that nutritional therapy can have a clear effect on the risk of chronic diseases and obesity. The measurement tool used primarily in clinical trials to detect obesity and overweight is called body mass index (BMI). A relationship has been found between periodontal risk indicators and adolescent obesity, which can lead to oral diseases Important indicators of being

metabolically healthy or unhealthy include waist circumference, low-grade inflammation, HDL cholesterol, blood pressure and Herbs diabetes.

3. Recommended for Obesity^[9]

Evidence has emerged to support increased herb intake as an effective strategy for obesity and weight management. The use of plants and plant products can keep metabolic syndrome under control. There are few drugs on the market for the prevention/management of obesity, but costs, effectiveness and side effects must be considered. For centuries, people in various countries have used natural products such as herbal supplements to control body weight.

4. Traditional Medicine and Obesity^[51]

Ayurveda (Ayur = life, Veda = knowledge), which is the "science of life", originates from Vedic times and is part of a holistic health system. The main source of Aryan culture and medicine in ancient India is the four Vedas, which Brahma (the creator) is said to have opened to sages about 6,000 years before the Christian era. The main focus of Ayurveda is to maintain and promote health and it also offers treatment for diseases. Many undesirable body structures (about eight) are mentioned in "Charaka Samhitas", an authentic source of Ayurveda. Obesity or "Medoroga" is one of them. It is said that it is relatively easy to help an underweight person than an overweight person. The overweight problem may be due to actual increase (Meda Dhatu) or malfunction of the fatty component. Therefore, they require a different approach. In very rare cases, it can be a consequence of other metabolic disorders. We reviewed the available Ayurvedic/traditional textbooks for obesity plants.

5. An Ideal Herbal Remedy for Obesity: A Proposal^[48]

A consistent and safe herbal product for weight loss. In our literature review, herbal products have shown potential effects on weight management. However, for most products, more information is needed to assess suitability as an anti-obesity product. We have tried to provide important perspectives for the ideal herbal product for the treatment of obesity.

- 1) In a well-designed, randomized, placebo-controlled clinical trial, it should reduce body weight by 10% compared to placebo.
- 2) should show signs of biological improvement. markers such as blood pressure, lipids and glycemia.
- 3) The mechanism of action should be known.
- 4) should be standardized with bioactive phytochemicals responsible for the anti-obesity effect.
- 5) There should be no side effects.

6.) Obesity and Psychiatric Co-Morbidity^[11,12,13,14]

Evidence for an interaction between certain mental disorders (binge eating, anxiety, mood disorders) and obesity is bidirectional.^[11] Several populations indicate that social or cultural factors may moderate or mediate the association between obesity and mood disorders. People who suffer from psychiatric disorders have a higher risk of becoming overweight and obese than healthy people. Currently, there is no clear relationship between obesity and psychopathology, and it is still not clear whether possible psychological disorders are a cause or a consequence of obesity.^[12]

Studies show that certain psychological disorders seem to be more common in overweight people, such as depression, anxiety, drug addiction, etc., although the direction of the explanatory relationship is not clear; in addition, the opposite result was also found. In addition, there are studies that identify a high prevalence of psychiatric disorders in treatment-seeking obese patients, suggesting psychiatric evaluation of obese patients as a routine practice.^[13,14] **1) Turmeric:-[16-35]**



1.Figure: - Curcuma longa

Biological Source:- The biological source of turmeric is the rhizomes of the turmeric plant. The rhizomes is the underground stem of the plant.

Botanical Classification: -

Class: Liliopsida

Subclass: Commelinids

Order: Zingiberales

Family: Zingiberaceae

Genus: Curcuma

Species: Curcuma longa

Organoleptic Characters:- 1.

Colour: Deep Orange

2. **Odour:** Aromatic

3. **Taste:** Pungent

Chemical Constituents: Curcuminoids, Turmerones, Polysaccharides, Proteins&Carbohydrates, Vitamins & Minerals.

Mechanism of action:-

1. Effect on gastrointestinal system
2. Effect on cardiovascular system
3. Effect on nervous system
4. Effect on lipid metabolism
5. Anti-inflammatory activity
6. Antioxidant effect
7. Antidiabetic effect

Table:-1 Herbs Used in Treatment in Obesity

Herbs	Dose	Duration	Outcomes
<i>Curcuma longa</i>	1000mg/day	8-12Week	<p>Significant decrease in the body weight, body mass index waist and hip circumferences, waist-to-hip ratio, fasting glucose, insulin resistance, and increased HDL cholesterol.</p> <p>No influence on insulin, BMI, triglyceriden, total cholestrol, and low-density lipoprotein (LDL) cholesterol concentration.</p>

Adverse Effect:

1. Causes Stomach Upset
2. Triggers Heartburns
3. Leads To Vomiting
4. Affects Stool Elimination
5. Leads To Bleeding
6. Causes Hypoglycaemia
7. Negative Interacts With Other Drugs

Advantages:-

- 1.Wond Healing
- 2.Pain Relief
- 3.Immune Support 5.Brain Health
- 6.Digestive Health

2) Vaividang:-^[36-38]2. Figure:- *Embelia ribes*

Biological Source:- The biological source of turmeric is the rhizomes of the turmeric plant. The rhizomes is the underground stem of the plant.

Botanical Classification:-

- ✦ **Class:** Mangnoliopsida
- ✦ **Phylum:** Angiosperms
- ✦ **Order:** Myrtales
- ✦ **Family:** Primulaceae
- ✦ **Genus:** Embelia ✦ **Kingdom:** Plantae

Organoleptic Character:- 1.

Colour: Deep Orange

2. **Odour:** Aromatic

3. **Taste:** Pungent

Chemical Constituents : Embelin, Quinones, Volatile oil, Resins, Alkaloids, Tannins.

Mechanism of Action:-

1. Effects of Embelia ribes on Elevated Blood Pressure
2. Effects of Embelia ribes on Dyslipidemia
3. Effects of Embelia ribes on Elevated Blood Sugar
4. Effects of Embelia ribes on obesity

Table:-2 Herbs Used in Treatment of Obesity

Herbs	Dose	Duration	Outcomes
Embelia ribs	50 mg/day	3 Weeks	Evaluated against hyperlipidemia & oxidative stress in HFD-induced obesity.

Adverse Effect:-

1. Toxicity
2. Pregnancy and Breastfeeding
3. Gastrointestinal issues such as cramps diarrhea, or nausea
4. Allergic Reactions
5. Interactions With Medications

Advantages:-

1. **Digestive Health:-** Vaividang is said in Ayurvedic medicine to enhance digestive, health by encouraging healthy digestion and reducing digestive problems like gas and blotting.

3. **Antioxidant Properties:-** Compounds found in vaividang have antioxidant properties. The body benefits from antioxidants ability to shield it from oxidative stress, which is good for general helath.

3) Ginseng:-^[39,40]



3. Figure: *Panax ginseng*

Biological Source: Ginseng is a popular herbal remedy that is derived from the roots of several species plant species belonging to *Panax ginseng*.

Botanical Classification:-

- ✦ **Kingdom:** Plantae
- ✦ **Division:** Angiospermae
- ✦ **Class:** Dicotyledoneae
- ✦ **Subclass:** Archichamydeae
- ✦ **Order:** Umbeliflorae
- ✦ **Family:** Araliaceae ✦ **Genus:** Panax

Chemical Constituents:- Ginsenosides, Polysaccharides, Peptides, polyactylenes, panaxans, Flavonoids, Minerals.

Mechanism Of Action:-

1. **Adptogenic Properties:-** Ginseng is Frequently categorized as an adptogen, it may aid in the bodys ability to adjust to stress and regain equilibrium. It can assist control the hypothalamus-pituitary-adrenal (HAP) axis, which is an important part of the body's stress response.
2. **Antioxidative Activity:-** ginsenosids and other ginseng-derived substance can assist in scavenging damaging free radicals and lessening oxidative stress within the body. This may shield tissues and cells from harm brought on by aging and a variety of disorders.
3. **Cardiovascular Activity:-** Ginseng can have a positive effect on cardiovascular health by improving blood vessel function and lowering blood pressure. Some studies show that ginsenosides can help relax blood vessels and improve circulation.
4. **Energy and Cognitive Enhancement:-** Some people use ginseng to improve energy level and cognitive function. It is believed to increase blood flow and oxygen delivery to tissues, which can improve mental and physical performance.

Table-3 Herbs Used in Treatment of Obesity

Dose	Duration	Outcomes
8000mg/day	8Weeks	Significant decrease in body weight and M1 but no significant reduction in waist circumference, body fat percentage, triglyceride, total cholesterol, highdensi cholesterol, and glucose.

Adverse Effects:-

1. Hypertension
2. Isonomia
3. Itching
4. Euphori
5. Rose Spot
6. Allergic skin reactions
7. Spinning Sensation

Advantages :-

1. Mood & Reduced Stress
2. Weight Loss
3. Improve Brain Function
4. Prevent Cancer
5. Boost Immune System
6. Relieves menopause Symptom Improve

4) Bheda:-[41,42]**4.Figure:- Terminalia bellirica**

Biological Source :- It consists of dried ripe fruits of the plant Terminalia belerica Linn.

Botanical Classification :-Tannins, Gallic Acid, Ellagic Acid, Flavonoids, Vitamin-C

- ✦ **Tribe:** Diospyreae
- ✦ **Genus:** Diospreae
- ✦ **Kingdom :** Plantae
- ✦ **Division :** Mangnoliphyta
- ✦ **Subdivision:** Mangnoliophytina
- ✦ **Class:** Rosopsida
- ✦ **Subclass:** Dilenlidae
- ✦ **Super Order:** Primulanae
- ✦ **Order:** Ericales
- ✦ **Suborder:** Ebenineae ✦ **Family:** Ebenaceae ✦ **Species:-**Kaki

Chemical Constituents :**Mechanism Of Action:-**

- 1. Laxative Effect:-** Terminalia bellerica is known for its mild laxative properties. It can help regulate bowel movements and relieve constipation. The laxative effect is mainly due to the high fiber content and tannin, which promote bowel regularity.
- 2. Antioxidative Activity:-** The plant contains various phenolic compounds, including tannin, gallic acid, ellagic acid, and flavonoids, which have antioxidant properties. Antioxidants help neutralize harmful free radicals in the body, which can protect cells and tissues from oxidative damage.
- 3. Anti-Inflammatory Effects:-** Some constituents of Terminalia bellerica may exhibit anti-inflammatory properties. This can be beneficial for conditions associated with inflammation, although the extract mechanism is not fully understood.

Table-4 Herbs Used in Treatment of Obesity

Herbs	Dose	Duration	Outcomes
Terminalia bellerica	400-500mg/day	4 Weeks	Stress management: Stress can lead to overeating and weight gain. Ayurvedic practices such as meditation and pranayama (breathing exercises) can help manage stress.

Adverse Effect :-

- 1. Digestive problems:-** Some people may experience digestive problems such as stomach upset or diarrhea when consuming Terminalia bellerica.
- 2. Allergic reactions:-** In rare cases, people may be allergic to Terminalia bellerica. Allergic reactions may include itching, rash, or difficulty breathing. If you suspect an allergy, stop using and consult a doctor.
- 3. Drug interactions:-** Terminalia bellerica may interact with certain medications. If you are taking prescription medications or have an underlying medical condition, contact your doctor.
- 4. Pregnancy and breast-feeding:-** It is important that pregnant and breast-feeding women use Terminalia bellerica with caution, as its safety in these populations has not been thoroughly studied. Consult your doctor before use.

Advantages :-

1. Antiobesity
2. Anticancer
3. Antiviral
4. Antiinflammation
5. Antibacterial
6. Antiplasmodium

5) Fenugreek:- [45,46]**5. Figure: *Trigonella foenum-graecum***

Biological Source:- It is obtained from the seeds of the ripe fruit of *Trigonella foenum-graecum* species.

Botanical Classification:-It is obtained from the seeds of the ripe fruit of *Trigonella foenum-graecum* species.

- ✦ **Kingdom :** Plantae
- ✦ **Division:** Mangnoliophyta
- ✦ **Order:** Fabales
- ✦ **Family:** Fabaceae
- ✦ **Genus :** *Trigonella*
- ✦ **Species :** *foenum-graecum*

Chemical Constituent :- Alkaloids, Saponins, Proteins, Phenolic Compounds, Essential Oils, Phytosterols **Meachanism**

Of Action:-

1.Appetite Suppression:- Fenugreek seeds contain soluble fiber, especially galactomannan, which can increase satiety and reduce overall food intake. By promoting satiety, fenugreek can help reduce calorie intake and aid in weight management.

2.Improved Insulin Sensitivity:- Fenugreek has been shown to improve insulin sensitivity. It can lower blood sugar and decrease insulin resistance. Better insulin control can help regulate glucose metabolism and have a positive effect on weight management.

3.Reduced Fat Accumulation:- Some animal studies show that fenugreek can prevent the accumulation of adipose tissue. This effect can be related to its effects on various enzymes and pathways involved in lipid metabolism.

4.Metabolic Rate:- Fenugreek can have a mild thermogenic effect, which means it can increase your metabolism. A higher metabolic rate causes you to burn more calories, which can help you lose weight or keep it off.

5.Blood Lipid Profile Improvement:- Fenugreek can help lower total cholesterol, LDL cholesterol ("Bad" cholesterol) and triglycerides while increasing HDL cholesterol ("Good" cholesterol). An improved lipid profile can promote cardiovascular health and help control obesity.

6.Gut Microbiota:- Fenugreek can influence the composition of the intestinal microflora. A balanced gut microbiome is increasingly recognized as important for weight management and metabolism.

Table-5 Herbs Used in Treatment of Obesity

Herbs	Dose	Duration	Outcomes
<i>Trigonellafoenumgraecum</i>	1.2gm/day	2 Weeks	Fenugreek seeds are high in fiber, which can aid digestion and prevent constipation

Adverse Effect:-

- 1.Blotting & Upset of stomach
- 2.Hypoglycemia
- 3.Allergic Reactions
- 4.Pregnancy and Breastfeeding
- 5.Hypersensitivity Reactions

Advantages:-

- 1.Blood Sugar Control
- 2.Cholesterol Management
- 3.Digestive Health
- 4.Weight Management
- 5.Appetite Control 6.Nutrient-Rich
- 7.Menstrual Relief
- 8.Skin Health

6) African Mango :-^[47]6.Figure:- *Irvingia gabonensis*

Biological Source:- *Irvingia gabonensis* is a fruit that grows on the African mango tree, which is native to West and Central Africa. The African mango tree produces large edible fruits commonly called African mango, wild mango, bush mango or ogbono. Fruits are usually green when unripe and turn orange or red.

Botanical Classification :-

- ✦ **Order:** Malpighiales
- ✦ **Family:** Irvingiaceae
- ✦ **Genus:** *Irvingia*
- ✦ **Species:** *I. gabonensis*
- ✦ **Kingdom:** Plantae

Chemical Constituents :- Fiber, Fatty Acids, Amino Acid, Dietary Polyphenols Proteins, Water

Mechanism of Action:-

1.Appetite Regulation:-African mango is thought to affect appetite control by affecting the hormones that cause satiety. This can help reduce appetite and increase satiety, which can lead to less food consumption.

2.Metabolism Regulation: Some studies show that African mango can help regulate metabolism by improving insulin lowering blood sugar. Better insulin sensitivity can potentially lead to better utilization of glucose in the body and support weight management.

3.Lipid Metabolism: The ability of African mango to influence lipid metabolism has been studied. It can help lower blood cholesterol and triglycerides, which are risk factors for cardiovascular disease.

4.Gut Microbiota: It is important to note that while African mango shows promise in some studies, results can vary, and not all study results support its effectiveness for weight management or other health benefits. Additionally, individual responses may vary and more research is needed to fully understand the mechanisms of action and determine its safety and efficacy.

Table-6 Herbs in Treatment of Obesity

Herbs	Dose	Duration	Outcomes
<i>Irvingia gabonensis</i>	150 gm/day	8 Weeks	<i>Irvingia gabonensis</i> seeds can lower cholesterol due to their high fiber content. Fiber increases the removal of cholesterol from the body. Some research suggests that the seeds of <i>Irvingia gabonensis</i> may also affect fat cells, possibly slowing down fat cells and increasing fat breakdown.

Adverse Effects:-

- 1.Headach
- 2.Sleep Disturbances

- 3. Gastrointestinal Issues
- 4. Allergic Reactions

Advantages:

- 1. Weight Management
- 2. Appetite Control
- 3. Improved Lipid Profile
- 4. Blood Sugar Regulation

7) Spirulina: -[49,50]



7. Figure: *Arthrospira platensis*

Biological Source :- Spirulina Is Made From Pure Cultures Of The Photosynthetic Prokaryotic Cyanobacterium Arthrospira. Spirulina Is Made From Pure Cultures Of The Photosynthetic Prokaryotic Cyanobacterium Arthrospira.

Botanical classification :

- ✦ **Kingdom:** Plantae
- ✦ **Subkingdom:** Viridaeplantac
- ✦ **Division:** Tracheophytina
- ✦ **Subdivision:** Spermtohytina
- ✦ **Class:** Magnoliopsida
- ✦ **Order:** Solanales
- ✦ **Family:** Solanaceae
- ✦ **Genus:** Solanum ✦ **Species:** Solanum tuberosum L.

Constituents: Nucleic Acids, Phenolic Compounds Chemical, Enzymes, Phycocyanin, Chlorophyll.

Table-7 Herbs Used in Treatment of Obesity

Herbs	Dose	Duration	Outcomes
Arthrospira platensis	1gm/day	12 Weeks	Reduction in Bmi&Weight Reduce apptite

Meachanismof Action:-

- 1.Nutrient Density:-** Spirulina is a highly nutritious food that provides essential vitamins, minerals and complete protein. Its nutritional value can be daily nutritional needs and support overall health.
- 2.Detoxification:-** The chlorophyll in spirulina has been linked to potential detoxifying properties, helping the body eliminate harmful substances and heavy metals.
- 3.Lipid and Cholesterol Regulation:-** The chlorophyll in spirulina has been linked to potential antioxidant properties, helping the body eliminate harmful substances and heavy metals.
- 4.Immune Modulation:-** Spirulina contains compounds such as phycocyanin, which can support and modulate the immune system. These compounds can improve the function of immune cells, which can help the body fight infections and other problems related to the immune system.

Adverse Effects:- 1.Possible

Risk for Those

2.Possible Risk for Those with Phenylketonuria

3.Thyroid Interference

4.Contaminants

5.Overstimulation of the Immune System

Conclusion:-^[41,51] A better understanding of the available evidence-based herbal sciences will continue to drive quality research in obesity management with strong benefits for end users. True, randomized, double-blind, placebo-controlled clinical trials using herbal products demonstrate their potential benefits. Significant weight loss after placebo reduction and a known mechanism of action are required to convince users of effective weight management. The main factors that can contribute to obesity are reduced physical activity, excess caloric food, depression, concomitant medication, anorexia, personality traits, genital/hereditary predisposition, economic growth and lifestyle changes. Medicinal plants, especially edible plants, have long been used as traditional knowledge in the treatment and prevention of obesity, especially in Asian countries, because various bioactive compounds of both herbs and fruits have been found useful for the discovery and development of antibacterial drugs. . obesity drugs. Obesity is a major problem for the normal growth of children and is associated with both primary and secondary health risks such as high blood pressure, insulin resistance, hypertension, cardiovascular diseases and various forms of cancer. Various mechanisms by which herbs can affect weight loss include increasing leptin levels, hypolipidemic and hypoglycemic effects, reducing fat absorption, affecting fat metabolism, increasing metabolism, reducing appetite and inhibiting carbohydrate intake. The main medicinal plants that are common in the traditional medicine of various countries due to their anti-obesity effect are *Acosmium dasycarpum* (Vog.) Yakovlev, *Allium cepa* L., *Aloe*.

REFERENCES

- [1].Shahrajabian, M.H.; Sun, W.; Cheng, Q. Exploring *Artemisia annua* L., artemisinin and its derivatives, from traditional Chinese wonder medicinal science. *Not. Bot. Horti Agrobot.* **2020**, *48*, 1719-1741.
- [2].Shahrajabian, M.H.; Sun, W.; Cheng, Q. Chemical components and pharmacological benefits of basil (*Ocimum basilicum*): A review. *Int. J. Food Prop.* **2020**, *23*, 1961–1970.
- [3]. Shahrajabian, M.H.; Sun, W.; Cheng, Q. Traditional herbal medicine for the prevention and treatment of cold and flu in the autumn of 2020, overlapped with COVID-19. *Nat. Prod. Commun.* **2020**, *15*, 1–10.
- [4]. Shahrajabian, M.H.; Sun, W.; Soleymani, A.; Cheng, Q. Traditional herbal medicines to overcome stress, anxiety and improve mental health in outbreaks of human coronaviruses. *Phytother. Res.* **2020**, *2020*, 1–11.
- [5]. Citat <https://www.mdpi.com/2076-3417/11/17/7889>
- [6]. Tchang, B.G.; Tarazi, M.S.; Aras, M.; Shukla, A.P. An update on pharmacotherapeutic strategies for obesity. *Expert Opin. Pharmacother.* **2021**, *22*, 1305–1318.
- [7]. Van der Merwe, M.-T. Obesity in women—a life cycle of medical risk. *J. Endocrinol. Metab. Diabetes S. Afr.* **2009**, *14*, 139–142.
- [8]. Papagianni, M.; Tziomalos, K. Effect of obesity on the outcome of pneumonia. *Expert Rev. Endocrinol. Metab.* **2017**, *12*, 315–320.
- [9]. D. Gosh, “A Botanical Approach to Managing Obesity,” University of Wollongong, Wollongong, 2009[Citation Time(s):2]
- [10]. L. L. Ioannides-Demos, L. Piccenna and J. J. McNeil, “Pharmacotherapies for Obesity: Past, Current, and Future Therapies,” *Journal of Obesity*, Vol. 2011, 2011, Article ID: 179674. [doi:10.1155/2011/179674](https://doi.org/10.1155/2011/179674)[Citation Time(s):1]
- [11]. R. P. Pickering, B. F. Grant, S. P. Chou, and W. M. Compton, “Are Overweight, Obesity, and Extreme Obesity Associated with psychopathology? Results from the National Epidemiologic Survey on alcohol and Related Conditions,” *Journal of Clinical Psychiatry*, Vol. 68, No. 7, 2007, pp. 998-1009. [doi:10.4088/JCP.v68n0704](https://doi.org/10.4088/JCP.v68n0704)ion Time(s):1]
- [12]. J. I. Baile and M. J. Gonzalez, “Psychopathological comorbidity in obesity,” *Anales del sistema sanitario de Navarra*, Vol. 34, No. 2, 2011, pp. 253-261. [doi:10.4321/S1137-66272011000200011](https://doi.org/10.4321/S1137-66272011000200011) [Citation Time(s):12]
- [13]. B. Britz, W. Siegfried, A. Ziegler, C. Lamertz, B. M. Herpertz-Dahlmann, H. Remschmidt, H. U. Wittchen and J. Hebebrand, “Rates of Psychiatric Disorders in a Clinical Study Group of adolescents with Extreme Obesity and in Obese Adolescents Ascertained via a Population Based Study,” *International Journal of Obesity Related Metabolism and disorder*, Vol. 24, No. 12, 2000, pp. 1707-1714. [Citation Time(s):1]
- [14]. J. Lee, K. Chae, J. Ha, B.Y. Park, H. S. Lee, S. Jeong, M. Y. Kim and M. Yoon, “Regulation of obesity and lipid disorders by Herbal Extracts from *Morus alba*, *Melissa officinalis*, and *Artemisia capillaries* in high-fat Diet-Induced Obese Mice,” *Journal of Ethnopharmacology*, Vol. 115, No. 2, 2008, pp. 263-270. [doi:10.1016/j.jep.2007.09.029](https://doi.org/10.1016/j.jep.2007.09.029) [Citation Time(s):2]
- [15]. T. Longvah¹, R. Ananthan¹, K. Bhaskarachary K. Venkaiah, *Indian Food Composition Table*. National Institute of Nutrition. 2017; 55-85p.
- [16]. Gupta S.C., Patchva S., Aggarwal B.B. Therapeutic Roles of Curcumin: Lessons Learned from Clinical Trials. *American Association of Pharmaceutical Scientists Journal*. 2013; 15: 195–218p.
- [17]. Aggarwal B.B., Kumar A., Bharti A.C. Anticancer potential of curcumin: Preclinical and clinical studies. *Anticancer Research*. 2003; 23: 363–398p.

- [18]. Vera-Ramirez L., Perez-Lopez P., Varela-Lopez A., Ramirez-Tortosa M., Battino M., Quiles J.L. Curcumin and liver disease. *Biofactors*. 2013; 39: 88–100p.
- [19]. Wright L.E., Frye J.B., Gorti B., Timmermann B.N., Funk J.L. Bioactivity of turmeric-derived curcuminoids and related metabolites in breast cancer. *Current Pharmaceutical Design*. 2013;19: 6218–6225p.
- [20]. Wang YJ, Pan MH, Cheng AL, Lin LI, Ho YS, Hsieh CY et al. Stability of curcumin in buffer solutions and characterization of its degradation products. *Journal of Pharmaceutical and Biomedical Analysis*. 1997; 15:1867-1876p.
- [21]. Bandyopadhyay U, Das D, Banerjee RK. Reactive oxygen species: oxidative damage and pathogenesis. *Current Science*. 1999; 77:658-666p.
- [22]. Khajehdehi P. Turmeric: Reemerging of a neglected Asian traditional remedy. *Journal of Nephrothol*. 2012; 1(1):17-22p.
- [23]. Mohanty I, Arya D. S, Gupta S. K. Effect of *Curcuma longa* and *Ocimum sanctum* on myocardial apoptosis in experimentally induced myocardial ischemic-reperfusion injury. *BMC Complement Alternative Medicine*. 2006; 6:3p.
- [24]. Araújo M. C, Dias F. L, Takahashi C. S. Potentiation by turmeric and curcumin of gamma- radiation-induced chromosome aberrations in Chinese hamster ovary cells. *Teratog Carcinog Mutagen*. 1999; 19:9–18p
- [25]. Platel K, Rao A, Saraswathi G, Srinivasan K. Digestive stimulant action of three Indian spice mixes in experimental rats. *Nahrung*. 2002; 46:394–398p.
- [26]. Mukerji B, Zaidi S. H, Singh G. B. Spice and gastric function: Part I-effect of *Curcuma longa* in the gastric secretion in rabbits. Lucknow, India: Central Drug Research Institute. *Journal of Scientific and Industrial Research*.1961;20:25–28p. [27]. : <https://www.researchgate.net/publication/237635269>
- [28] World Health Organization (WHO),. Monographs on Selected Medicinal Plants. Volume 1. Geneva 1999
- [29]. Zhao Z: Application of microscopic techniques for the authentication of herbal medicines. *Microscopy: Science, Technology, Applications and Education* 2010; 4(2): 803812.
- [30]. Hiremath GB, Kaliwal BB: Pharmacognostic Evaluation of Rhizome of *Curcuma pseudomontana* J. Graham. *IJPBS* [31]. 2015_Bouzabata_IJPharmacognosy_Curcuma
- [32]. foods-06-00092
- [33]. Singh J, Singh AK, Pravesh R. Production and trade potential of some important medicinal plants: an overview. *Proceedings of the 1st National Interactive Meet on Medicinal and Aromatic Plants*. 2003:50. [5] Warriar PK, Nambiar VP, Ganapathy PM. Some important medicinal plants of the western ghats, India: a profile.2000.
- [34]. Warriar PK, Nambiar VP, Ganapathy PM. Some important medicinal plants of the western ghats, India: a profile.2000 [35]. Street RA, Prinsloo G. Commercially important medicinal plants of South Africa: a review. *Journal of chemistry*. 2013 Jan 1;2013.
- [36]. Chopra RN, Nayar SL, Chopra IC. Glossary of Indian medicinal plants. New Delhi: Council of Scientific & Industrial Research; 1956
- [37]. Dixit, V. P., Jain, P. and Joshi, S. C., Hypolipidaemic effects of *Curcuma longa* L and *Nardostachys jatamansi* DC in tritoninduced hyperlipidaemic rats. *Indian J. Physiol. Pharmacol.*, 1988, 32, 299–304.
- [38]. Krishnaswamy M, Purushothaman KK. Antifertility properties of *Embelia ribes*:(embelin). *Indian journal of experimental biology*. 1980 Nov;18(11):135960
- [39]. Nag, S.A.; Qin, J.J.; Wang, W.; Wang, M.H.; Wang, H.; Zhang, R. Ginsenosides as anticancer agents: *In vitro* and *in vivo* activities, structure-activity relationships, and molecular mechanisms of action. *Front Pharmacol.*, **2012**, 25, 1-18.
- [40]. Zhu, J.; Mu, X.; Zeng, J.; Xu, C.; Liu, J.; Zhang, M.; Li, C.; Chen, J.; Li, T.; Wang, Y. Ginsenoside Rg1 prevents cognitive impairment and hippocampus senescence in a rat model of D-galactose-induced aging. *PLoS One*, **2014**, 9(6), e101291
- [41]. Kamangar, F.; Gao, Y.T.; Shu, X.O.; Kahkeshani, K.; Ji, B.T.; Yang, G.; Li, H.L.; Rothman, N.; Chow, W.H.; Zheng, W. Ginseng intake and gastric cancer risk in the Shanghai women’s health study cohort. *Cancer Epidemiol. Biomarkers Prev.*, **2007**, 16, 629-630
- [42]. Oke JM, Hamburger MO. Screening of some Nigerian medicinal plants for antioxidant activity using 2, 2, diphenylpicrylhydrazyl radical. *Afr. J. Biomed. Res*. 2002; 5:1-2.
- [43]. <https://www.mdidea.com/products/proper/proper06001.ht ml>
- [44]. <https://www.easyayurveda.com/2013/01/13/bibhitakibaheda-terminalia-bellerica-uses-ayurveda-details/>
- [45]. International Diabetes Federation. 5th edition. Brussels, Belgium: IDF Diabetes Atlas; 2011.
- [46]. Uemura T, Hirai S, Mizoguchi N, Goto T, Lee JY, Taketani K, Nakano Y, Shono J, Hoshino S, Tsuge N, et al: Diosgenin present in fenugreek improves glucose metabolism by promoting adipocyte differentiation and inhibiting inflammation in adipose tissues. *Mol Nutr Food Res* 2010, 54:1596–1608
- [47]. BushMangoIrvingiagabonensisNewPotentialMultipurposeFruitTreefor
- [48]. https://www.scirp.org/html/2-2600389_21050.htm#Table%201.
- [49]. Zeinalian R, Farhangi MA, Shariat A, et al. The effects of *Spirulina platensis* on anthropometric indices, appetite, lipid profile and serum vascular endothelial growth factor (VEGF) in obese individuals: a randomized double blinded placebo controlled trial. *BMC Complement Altern Med* 2017;17:225.
- [50]. Terry MJ, Maines MD, Lagarias JC. Inactivation of phytochrome- and phycobiliprotein-chromophore precursors by rat liver biliverdin reductase. *J Biol Chem* 1993;268:26099–106