

FORMULATION AND EVALUATION OF POLYHERBAL GRANULES FOR ANTI- OBESITY

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ABSTRACT: -

Obesity is a long-term health condition characterized by an excessive accumulation of body fat. It is commonly assessed using Body Mass Index (BMI), which is calculated by dividing a person's weight in kilograms by the square of their height in meters (kg/m^2). Based on BMI, individuals are categorized into different groups: normal weight, overweight ($25\text{--}30 \text{ kg}/\text{m}^2$), moderate obesity ($30\text{--}35 \text{ kg}/\text{m}^2$), and severe obesity (above $35 \text{ kg}/\text{m}^2$).

Obesity is becoming a serious health problem in today's lifestyle, leading to diseases like diabetes and heart issues. This study focuses on developing a natural and safe herbal formulation for weight management using medicinal plants such as *Camellia sinensis* and *Garcinia cambogia*.

In this research, polyherbal green tea granules (or effervescent granules) are prepared to provide an easy, tasty, and effective way to reduce weight. The formulation is designed to boost metabolism, reduce appetite, and improve digestion. It is then evaluated for different parameters like stability, dissolution, and quality.

Overall, this study aims to offer a cost-effective, user-friendly, and herbal alternative to synthetic anti-obesity drugs with fewer side effects.

KEYWORDS: -

Obesity, Health, Body Fatt, herbal, Anti-obesity, Granules, Patient, Effect, Test, Disorders, Increase, India, Diseases, Problem, Weight.

1. INTRODUCTION: -

The increasing prevalence of obesity and its associated health issues has created a strong demand for safe and natural methods of weight management. In this context, herbal effervescent granules have emerged as an innovative and effective option. These formulations combine the health benefits of medicinal plants with the ease and pleasant taste of effervescent dosage forms. When added to water, these granules dissolve quickly, releasing carbon dioxide and producing a refreshing fizzy drink. This not only makes them more enjoyable to consume but also improves patient compliance while efficiently delivering active herbal components and other medicinal herbs are known for their ability to enhance metabolism, reduce appetite, and promote fat burning. Additionally, the effervescent formulation helps in faster absorption and better bioavailability of these bioactive components, which may increase their overall effectiveness in supporting weight loss.[1] Being overweight or obese is not just a matter of appearance; it is closely linked with several lifestyle-related disorders such as diabetes, abnormal lipid levels, high blood pressure, heart diseases, joint problems, and even certain types of cancer. Obesity has emerged as a major health concern in recent years, affecting people of all age groups, genders, and backgrounds, with its incidence rising rapidly. Conventional drug treatments for

obesity are often costly and may cause undesirable side effects.[2] Obesity occurs when excess fat accumulates in the body and causes harmful effects. Body Mass Index (BMI) is commonly used to assess whether a person is overweight or obese by comparing weight to height. According to the World Health Organization, a BMI of 25 or more indicates overweight, while a BMI of 30 or more indicates obesity. BMI is a simple and useful tool for large populations and is applicable to both men and women. However, it is only an approximate measure and may not accurately reflect body fat levels in all individuals. Obesity is a chronic metabolic disorder caused by an imbalance between high energy intake and low physical activity. It is characterized by excessive fat accumulation beyond normal levels and is recognized as a serious global health problem [3]

Table no. 1 Polyherbal Green Tea Ingredients [3]

2. REVIEW OF LITERATURE: -

2.1 Gaurav Santosh kulwant, et.al (2025)

Recent studies indicate that herbal effervescent granules are gaining attention as an innovative dosage form for weight management. These formulations combine medicinal herbs with effervescent systems, enhancing palatability, patient compliance, and convenience. Upon dissolution in water, they release carbon dioxide, forming a pleasant fizzy solution that allows rapid drug release. Research suggests that herbs such as green tea, fenugreek, and ashwagandha possess anti-obesity properties by improving metabolism, suppressing appetite, and promoting fat oxidation. Furthermore, the effervescent formulation enhances the dissolution rate and bioavailability of active phytoconstituents, leading to faster absorption and improved therapeutic efficacy. Overall, herbal effervescent granules represent a promising approach for effective and patient-friendly obesity management.

2.2 Bendke NS et.al (2025)

In recent years, fast-dissolving drug delivery systems have attracted considerable attention and are increasingly being used because they are easy to administer and enhance patient compliance. These systems rapidly disintegrate or dissolve in the mouth without the need for water, making them especially useful for pediatric, geriatric, and bedridden patients who may have difficulty swallowing conventional dosage forms.

2.3 Elif Didem et.al (2025)

Obesity and its related health conditions have become a significant global public health issue, placing a heavy burden on healthcare systems and the economy. Although lifestyle changes such as a balanced diet, regular exercise, and behavioral modifications are the primary approaches for managing weight, many people struggle to maintain these habits over the long term.

2.4 Yogita Singh, Suhashi (2024)

Herbal drinks, made from natural ingredients, are increasingly popular due to their potential health benefits. In this study, an herbal beverage was developed using Ginger, Tulsi, and Stevia, which are known for their anti-inflammatory, antioxidant, antibacterial, and anti-diabetic properties. The formulation was optimized based on sensory evaluation and physicochemical analysis to achieve the best taste and quality. Additionally, the beverage was assessed for its microbiological quality, total phenolic content, and antioxidant activity to ensure its safety and effectiveness.

2.5 Lakhwinder Singh and Manisha Bhatti (2021)

Obesity is a complex condition influenced by both genetic and environmental factors, and it is linked with serious health risks and increased mortality. Recently, there has been growing interest in the use of herbal remedies for weight management. To understand the available evidence, researchers conducted a literature review using both online databases and traditional sources. Databases such as PubMed, Scopus, and Google Scholar were searched up to February 2012 using terms related to obesity and herbal medicine, including medicinal plants and Ayurvedic treatments. Only studies with available abstracts, full-text articles, or relevant books were included.

2.6 P. R. Chainpure et.al (2019)

Obesity is a complex disorder characterized by excessive accumulation of body fat, which increases the risk of serious health conditions such as heart disease, diabetes, and hypertension. It is commonly diagnosed when the body mass index (BMI) is 30 kg/m² or higher. In recent years, traditional herbal medicines have gained popularity over allopathic drugs due to their comparatively fewer side effects. The aim of this study was to formulate and evaluate an herbal tablet containing *Garcinia cambogia* and *Commiphora mukul* for the management of obesity.

2.7 Jarzab A, Kukula-Koch W (2018)

In the 21st century, obesity has emerged as a major global health problem, raising serious concern among scientists and medical professionals worldwide. Due to its increasing prevalence and associated complications, there is a growing need to develop effective treatments. As a result, significant efforts are being made to discover and develop new drug candidates that can help reduce body weight safely and effectively.

2.8 Ebrahimzadeh Attari V et.al (2018)

Recently, the potential benefits of ginger in managing obesity have been gained attention. However, its exact anti-obesity effects and mechanisms are not fully understood or thoroughly reviewed. Therefore, this study aimed to systematically evaluate the role of *Zingiber officinale* (ginger) in obesity management. For this purpose, databases such as PubMed, Scopus, Google Scholar, and ScienceDirect were searched for studies published between 1995 and May 2017 using relevant keywords. Only articles published in English were included, covering human, animal, and in vitro studies. Review articles, conference abstracts, and studies involving other varieties of ginger were excluded.

2.9 Hu J (2018)

A systematic review of toxicological studies and human intervention trials was conducted to evaluate the potential risks associated with the consumption of green tea and its preparations. The findings from laboratory studies indicated that the liver is the primary target organ, with hepatotoxicity identified as the main adverse effect. This toxicity was strongly linked to certain conditions, such as consuming high doses at once (bolus doses) or intake during fasting, and it was positively associated with higher levels of catechins, especially epigallocatechin gallate (EGCG). Similarly, analysis of adverse events from numerous human studies showed that concentrated, catechin-rich green tea products could cause liver-related side effects in a dose-dependent manner when taken in large amounts.

2.10 Patel R, Patel J, Kakkar S. (2013)

The present study aimed to develop an anti-obesity liquid formulation containing *Garcinia cambogia* extract, L-carnitine, and chromium picolinate, with good microbial stability and pharmacological effectiveness. The formulation was prepared using coconut water as a base and flavoring agent in different combinations. It was

evaluated for its physical characteristics, microbial quality, and drug content. The results showed that the formulation had acceptable appearance and microbiological properties, and it met the required drug content standards. The assay results indicated that the content of *Garcinia cambogia* (HCA).

2.11 Kazemipoor M. et.al (2012)

Literature reports that obesity is a major global health concern associated with numerous comorbid conditions such as Type 2 Diabetes, dyslipidemia, Hypertension, cardiovascular diseases, osteoarthritis, and certain cancers. The prevalence of obesity has increased significantly due to sedentary lifestyles and unhealthy dietary habits, affecting individuals across all age groups. Studies also highlight that conventional anti-obesity drugs, although effective, are often expensive and associated with adverse effects such as gastrointestinal disturbances, cardiovascular risks, and dependency. As a result, there is growing interest in safer, cost-effective, and natural alternatives, particularly herbal-based formulations for obesity management.

2.12 Yang Q. (2010)

The obesity epidemic in United States has gained significant media attention in recent years. An increase in the proportion of people who are obese has occurred alongside a growing use of non-caloric artificial sweeteners in food and beverages. Common examples include Aspartame, used in products like diet soft drinks, and Sucralose, which is also widely used in low-calorie beverages and foods. This parallel rise has raised questions about a possible link between artificial sweetener consumption and obesity trends.

3. NEED OF STUDY:

Obesity is increasing very fast and has become a serious health problem. It can lead to diseases like diabetes, high blood pressure, and heart problems. The medicines available for weight loss are often expensive and may cause side effects, so many people avoid using them. Because of this, there is a need to find a safe and natural method for weight management. Herbal ingredients like *Camellia sinensis* and *Garcinia cambogia* are known to help in reducing weight by improving metabolism and controlling appetite. Also, normal medicines are sometimes not easy or pleasant to take. So, making herbal formulations in the form of granules or effervescent drinks makes them tasty, easy to use, and more effective.

Therefore, this study is important to develop a simple, safe, and effective herbal product for managing obesity.

4. Aim and Objective:

4.1 Aim: - Formulation and Evaluation of Polyherbal Granules for Anti-obesity

4.2 Objective: -

To perform a comprehensive literature review on herbal ingredients with weight loss potential and effervescent drug delivery systems.

To correlate the weight loss activity of individual herbal components based on available scientific literature and studies.

To ensure formulation safety, compliance, and potential effectiveness for use as a natural weight loss aid.

To extract bioactive constituents from the herbal ingredients using suitable extraction techniques.

To formulate herbal effervescent granules using appropriate excipients and optimized formulation methods

To evaluate the prepared granules for: Pre-compression parameters: angle of repose, bulk and tapped density, Carr's index, Hausner's ratio post-compression parameters: effervescence time, pH, appearance, solubility, and taste.

To select suitable herbal ingredients based on their anti-obesity and metabolic activity.

To develop granules using wet granulation method Ensuring uniformity, stability, and easy administration.

To improve palatability of formulation Using natural sweetener like stevia.

To study stability of formulation Under different storage conditions.

To ensure safety and quality by performing microbial and phytochemical tests

To enhance patient compliance by developing an easy-to-use and pleasant-tasting dosage form.

5. Plan of work: -

5.1 Literature Review

5.2 Selection of Ingredient

5.3 Procurement of Materials

5.4 Pre-formulation Studies

5.5 Formulation Development of granules

5.6 Evaluation of Granules

5.7 Stability Study

5.8 Data Analysis & Result

5.9 Conclusion

5.10 Reference

6. Materials and Methodology:

6.1 Curcuma longa: -

Fig.no. 1 Curcuma longa (turmeric)

commonly known as turmeric, is widely used as a spice and has an important role in traditional medicine systems such as Ayurveda, Unani, and Homeopathy. It is known for its therapeutic properties and is used in the management of various health conditions, including cancer, neurological disorders, autoimmune diseases, cardiovascular problems, metabolic disorders, as well as lung and liver diseases. The plant contains several nutritional components like carbohydrates, fats, minerals, and moisture in varying amounts. is a widely used medicinal herb obtained from the dried rhizomes of the plant belonging to the family Zingiberoside. It contains an important active constituent called curcumin, along with volatile oils and other compounds that contribute to its therapeutic properties. In herbal green tea formulations, haldi is mainly used for its anti-inflammatory, antioxidant, and metabolism-enhancing effects. It helps in improving fat metabolism and supports liver function, which plays a key role in the digestion and breakdown of fats. Additionally, haldi aids in detoxification of the body and improves digestion by stimulating digestive enzymes. Its antioxidant activity

helps in reducing oxidative stress, which is often associated with obesity. When combined with other herbs like green tea and ginger, it produces a synergistic effect that enhances overall weight management. Thus, haldi is an important ingredient in polyherbal green tea as it promotes better metabolism, reduces inflammation, and supports overall health. [4]

6.2 Zingiber officinale: -

Fig.no. 2 Zingiber officinale (ginger)

commonly known as ginger, is originally native to Asia but is now widely cultivated in regions such as India, West Indies, Africa, and other tropical areas. The medicinal part of the plant is its underground stem, called a rhizome, which appears white to brown depending on how it is processed. This rhizome can be used in various forms, including paste, beverages, essential oil, and milk preparations.

According to traditional systems like Ayurveda, dried ginger rhizomes are used to treat conditions such as indigestion, loss of appetite, rheumatism, bloating, anemia, cough, and breathing difficulties. Fresh ginger is mainly used for stomach-related problems, colic, swelling, and oral infections. Additionally, ginger is commonly used to prevent nausea after surgery, motion sickness, loss of appetite, vomiting during pregnancy, and bronchitis. [5]

6.3 Camellia sinensis: -

Fig.no. 3 camellia sinensis (Green tea)

Camellia sinensis, commonly known as green tea, is widely grown in South and Southeast Asia, including regions like Malaysia and Australia. There are two main varieties of this plant: *C. sinensis* var. *sinensis*, mainly cultivated in China, Japan, and Taiwan, and *C. sinensis* var. *assamica* (Assam tea), which is predominantly grown in South and Southeast Asia and some parts of China. The young leaves and buds of the plant contain important components such as amino acids, carbohydrates, proteins, polyphenols, chlorophyll, volatile compounds, fluoride, alkaloids, minerals, and trace elements. Research suggests that green tea has beneficial health effects, including inhibiting the growth of liver cancer cells, reducing lipid levels, and helping in cancer prevention. Additionally, compounds called catechins present in green tea are believed to have anti-tumor properties. The sympathetic nervous system (SNS) plays an important role in controlling fat breakdown (lipolysis) and energy expenditure. Certain substances can increase or prolong the release of norepinephrine (NE), a key chemical messenger of the SNS, which helps enhance energy use and promotes fat burning. Caffeine, naturally present in green tea, supports this process by inhibiting phosphodiesterase—an enzyme that breaks down cyclic adenosine monophosphate (cAMP), a molecule involved in NE signaling. As a result, the effects of NE are prolonged, leading to increased fat metabolism. Green tea catechins (GTCs) and caffeine may work together in a synergistic manner, producing stronger effects on the SNS, thereby increasing energy expenditure and lipolysis. Additionally, GTCs may improve fatty acid oxidation and overall metabolism by influencing NE and SNS activity [6].

6.4 Garcinia cambogia: -

Fig.no. 4 Garcinia cambogia

Garcinia cambogia, commonly known as Malabar tamarind, is a plant native to Southeast Asia and is a rich source of hydroxycitric acid (HCA). Its fruits have been used for many years in traditional medicine, especially in parts of India.[7] The dried rind of the fruit is widely used in various Asian countries to treat conditions such as piles, constipation, rheumatism, swelling, intestinal worms, and irregular menstruation. The fruit contains a significant amount of hydroxycitric acid, typically ranging from about 10–30%. Research studies

suggest that it may help in weight management due to its potential anti-obesity effects. A meta-analysis of twelve studies showed that short-term use of Garcinia extract (1–2.8 g per day for about 8 weeks) produced a small but clinically meaningful weight loss effect. However, despite these encouraging findings, the overall evidence regarding its role in obesity management remains unclear. Some clinical trials have reported no significant improvement in blood lipid profiles (except triglycerides) or in body measurements and energy-related parameters after short-term use of Garcinia cambogia extract.[8]

6.5 Commiphora wightii: -

Fig.no.5 Commiphora wightii

Cyamopsis tetragon Loba produces guar gum (GG), a soluble dietary fiber obtained from its seeds. Most of the world's guar is grown in India and Pakistan, where the plant is also used as food, animal feed, and manure. GG is made up of a chain of mannose sugar units with galactose side groups. It appears as a white to slightly yellow, nearly odorless powder that dissolves easily in water to form a thick, viscous solution. Because of this property, it is widely used in food products as a stabilizer and thickening agent and can also be added to drinks, yogurt, soups, and nutritional formulas. However, its high thickness can sometimes limit its use, especially in liquid foods. To overcome this, partially hydrolyzed guar gum (PHGG) has been developed through an enzymic breakdown of GG. PHGG has similar structure and health benefits but a much lower molecular weight, making it less viscous, more soluble, and almost colorless, tasteless, and odorless. PHGG is considered a type of functional fiber, meaning it is a non-digestible carbohydrate that provides health benefits. It supplies a small amount of energy (about 1.6–1.9 kcal/g) and is not digested in the small intestine. Instead, both GG and PHGG are fermented by beneficial bacteria in the large intestine. [8]

6.6 Withania somnifera:-

Fig.no. 6 Withania somnifera

Ashwagandha is an important adaptogenic herb included in herbal green tea formulations, especially those aimed at weight management and overall wellness. Its role is not direct fat burning, but it supports multiple body functions that contribute to healthy weight reduction. High cortisol leads to: Increased appetite, fat accumulation (especially abdominal fat) by lowering cortisol, it prevents stress-induced weight gain, enhances overall metabolic activity, helps the body utilize energy more efficiently, Supports gradual and healthy weight loss, maintains endocrine system balance, prevents hormonal imbalances that may lead to obesity, anti-fatigue & energy booster, reduces weakness and fatigue, Helps maintain an active lifestyle, which is essential for weight loss, strengthens immunity, Keeps the body healthy during weight loss. [9]

6.7 Trigonella foe Num-graecum

Fig.no.7 Trigonella foe Num-graecum

Methi (Trigonella foenum-graecum) is an important ingredient in polyherbal green tea formulations due to its metabolic, digestive, and anti-obesity properties. It used as an appetite supporter, methi seeds contain high soluble fiber (galactomannan), swells in the stomach, creates a feeling of fullness (satiety) reduces overeating and calorie intake. Reduction of Fat Absorption Fiber binds with fats and sugars in the intestine, slows down absorption of: Lipids, Carbohydrates, helps in weight control improves lipid profile helps reduce: Cholesterol, Triglycerides, Prevents fat accumulation in the bod. Fats. Stimulates gastric secretions, Prevents: Bloating, Constipation, Methi enhances overall anti-obesity effect. Adds functional value to formulation, supports gut health, makes the formulation more holistic, Targets: Appetite, Metabolism, Blood sugar [9].

6.8 Stevia rebaudiana:-

Fig.no. 8 Stevia rebaudiana

It is used as a natural sweetener and provides a sweet taste without sugar containing stevia glycosides (very high sweeteners 2002-2003x). It does not add calories ideal for weight loss / anti-obesity formulations. It is also known as a diabetic friendly. It improves patient compliance and makes herbal tea more palatable.[15] Stevia is a natural sweetener derived from plants, so many people prefer it over artificial sweeteners. However, it also has some limitations. [10] People often prefer non-caloric artificial sweeteners instead of sugar when trying to lose or control their weight. Sugar contains a high amount of quickly absorbed carbohydrates, which can lead to excess calorie intake, weight gain, and metabolic disorders. Because of this, sugar and other high-calorie sweeteners like high fructose corn syrup are considered major contributors to obesity. As a result, many people believe that artificial sweeteners are a healthier option, possibly influenced by marketing from diet product industries.[11]

7. Methodology: -

Collection of Herbal Ingredients

↓

Drying of Raw Materials (Shade drying)

↓

Size Reduction (Grinding using mortar-pestle)

Sieving (Using suitable mesh / cloth)

↓

Weighing of Ingredients (Accurate quantities)

Dry Mixing of All Powders

↓

Preparation of Binder Solution

(Gum acacia / PVP in water or ethanol)

↓

Wet Granulation (Addition of binder solution)

Formation of Damp Mass

↓

Passing Through Sieve (Granule formation)

Drying of Granules (40–50°C)

↓

Sizing of Granules (Uniform size)

Packaging (Sachets / Airtight container)

↓

Evaluation of Granules

Table no. 2 Polyherbal formulation

8. Evaluation Parameters: - [12]

8.1.1 Angle of repose: -

Fig.no. 9 Angle of repose

The angle of repose of powder was determined by the funnel method. The powder was passed through a funnel fixed to a burette stand at a height of 2.5 cm. A graph paper was placed below the funnel on the table. The height and radius of the pile were measured. Angle of repose of the powder was calculated using the formula:

Angle of repose (θ) = $\tan^{-1} h / r$

Where,

h = Height of the pile

r = Radius of the pile

Table no. 3 Observation table of angle of repose of granules powder

8.2.1 Bulk density: -

Fig.no. 10 Bulk density

It is the ratio of total mass of granules and the bulk volume of granules.. It was measured by pouring the weighed powder into a measuring cylinder and initial weight was noted. From this, the bulk density was calculated according to the formula mentioned below.

Bulk density (D_b) = Mass (M) / Bulk volume (V_b)

Where,

M = the mass of powder,

V_b = the bulk volume of the powder

Table no. 4 Observation table of Bulk density of granules

8.2.2 Tapped density: -

Fig.no. 11 Tapped density

It is the ratio of total mass of the granules to the tapped volume of the granules. Volume was measured by tapping the powder 100 times, and the tapped volume was noted.

It is expressed in gm/ml and is given by

Tapped density (D_t) = Mass (M) / Tapped volume (V_t)

Where,

M = the mass of powder

V_t = the tapped volume of the powder.

Table no. 5 Observation table of tapped density of granules

8.2.3 Carr's index: -

Fig.no. 12 Carr's index

It is based on the apparent bulk density and the tapped density, the percentage Carr's index of the bulk drug was calculated by the following formula.

% Carr's index = $\frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped Density}} \times 100$

Table no. 6 Observation table of Carr's Index of granules

8.2.4 Hausner's ratio:

The ratio of tapped density and bulk density is called Hausner's ratio. It is an indirect index of ease of powder flow. It was calculated by the following formula.

Hausner ratio = $\frac{\text{Tapped density (D}_t\text{)}}{\text{Bulk density (D}_b\text{)}}$

Table no. 7 Observation table of Hausner's ratio of granules

8.2.6 Solubility test: -

Fig.no. 14 Solubility test

A solubility test for granules is carried out to determine how readily the granulated formulation dissolves in a specified solvent, usually water. In this test, a measured quantity of granules 1 gm in 100 ml is added to a fixed volume of solvent at a controlled temperature and stirred continuously.

Solubility = $\frac{\text{Dissolve drug}}{\text{Volume of solvent}}$

Table no. 8 Observation table of solubility of granules

8.2.7 Weight variation test for bags: -

Fig.no. 15 Weight variation test for bags

A weight variation test is performed to ensure that each tea bag contains a uniform amount of herbal formulation, which is essential for dose accuracy and quality control. To ensure uniform dose. Weigh 8 tea bags individually, Calculate average weight and deviation. Weight variation test confirms that each tea bag delivers a uniform quantity of herbal formulation, ensuring safety and effectiveness. Calculate by using formula like,

Average weight = $\frac{\text{Total weight of all tea bags}}{10}$

Table no 9. calculation table of weight variation of bags.

8.2.8 Effervescence test: -

Effervescence time is the time required for granules to completely dissolve in water with release of gas (CO₂).

Table no 10. Observation table of effervescence test of granules

8.3.9 pH meter test: -

Fig. no16 pH test of granules

A pH meter test of green tea granules is done to measure how acidic or alkaline the brewed tea solution is. This helps assess quality, flavor characteristics, and sometimes freshness or processing effects.

Table no 11. PH meter test of granules

8.3 Quality control test: -

8.3.1 Disintegration test of granules: -

Fig.no 16 Disintegration test of granules

This test checks how long the granules take to break into smaller particles under set conditions. It helps to see whether the granules can disintegrate within a suitable time, so they can spread properly and ensure better drug absorption (bioavailability) when taken. Recorded the total disintegration time (1–5 minutes depending on formulation) [13].

Table no 12 Observation table of disintegration test of granules

8.3.2 Ash value of granules: -

Fig.no 17 Ash value of granules

This test is done to find out how much inorganic residue is present in the granules after burning them. It helps to detect unwanted materials like dirt, sand, or other impurities. The ash value is an important parameter to check the purity and quality of the granules [13].

Table no. 13 Observation table of ash value of granules

8.3.3 Loss on Drying of Granules: -

This test was carried out to determine how much moisture is present in the granules. It involves measuring the loss of weight after drying, which indicates the amount of water and other volatile substances. This helps to ensure the stability of the granules and reduces the risk of microbial growth. The decrease in weight during drying can happen due to the loss of water as well as other volatile substances, since gravimetric methods cannot specifically measure only water. In some cases, the material may also break down during drying and release decomposition products. Therefore, this method is suitable for measuring water content only when it is certain that no decomposition occurs, and no other volatile substances are present [14].

Table no. 14 Observation table of loss on drying of granules

9. Result and Discussion:

The formulated herbal effervescent granules were evaluated for various parameters such as angle of repose, bulk density, Carr's index, Hausner ratio, disintegration time, ash value, and loss on drying. The results indicated good flow properties, acceptable moisture content, and rapid disintegration, suggesting suitability for oral administration. The polyherbal green tea granules containing extracts of *Camellia sinensis*, *Garcinia cambogia*, and other medicinal herbs were successfully prepared using the wet granulation method. The prepared granules were found to be uniform, free-flowing, and non-sticky, indicating good formulation characteristics.

Physical Evaluation

a) Angle of repose: -

The angle of repose of powder was determined by the funnel method. The powder was passed through a funnel fixed to a burette stand at a height of 2.5 cm

Indicated excellent flow property

Table no.15 angle of repose

Batch 2 showed excellent flow of property due to lower angle of repose. Batch 1 showed poor flow, while Batch 3 showed very poor flow, indicating difficulty in handling and processing.

b) Bulk density

Table no. 16 bulk density

Batch 2 showed higher bulk density, indicating better packing ability compared to Batch 1 and Batch 3.

c) Tapped Density

Table no. 17 Tapped density

Batch 2 showed the highest tapped density, indicating better compressibility and packing behavior

d) Carr's index

Table no. 18 Carr's index

Batch 2 showed excellent flow property with lowest Carr's index. Batch 1 and 3 showed good flow but less efficient than Batch 2.

e) Hausner's ratio

Table no. 19 Hausner's ratio

Batch 2 showed excellent flow, while Batch 1 showed poor flow and Batch 3 showed fair flow properties.

f) Solubility Test

Table no.20 Solubility Test

Batch 2 showed complete solubility, making it more effective. Batch 1 and 3 showed partial solubility.

g) Weight Variation Test

Table no. 21 Weight variation test

All tea bags showed uniform weight, indicating good quality control and proper dose uniformity.

h) Effervescence Test

Table no. 22 Effervescence test

Batch 2 showed rapid efficiency, indicating faster reaction and better performance.

i) pH test

Batch 2 passes the pH test, indicating slightly more acidic, stronger taste.

.j) Disintegration Test

Table no. 23 Disintegration test

All batches showed acceptable disintegration, but Batch 2 was the fastest.

k) Ash Value

Table no 24 Ash value

Batch 2 showed the lowest ash value, indicating fewer impurities and better purity.

l) Loss on Drying (LOD)

Table no. 25 Loss on Drying

Batch 2 showed the lowest moisture content, indicating better stability and less chance of microbial growth.

The results indicate that the prepared formulation possesses excellent physical and functional properties. The good flow characteristics and uniform particle size ensure easy handling and consistent dosing. The low moisture content contributes to better stability and shelf life of the granules.

The rapid dispersion and dissolution behavior confirm that the formulation allows quick release and absorption of active phytoconstituents, which enhances therapeutic effectiveness. The presence of bioactive compounds like flavonoids and polyphenols supports the anti-obesity potential of the formulation.

Additionally, the use of natural sweeteners improved palatability and patient compliance, making the formulation more acceptable for regular use. Compared to synthetic drugs, this herbal formulation provides a safer and cost-effective alternative with minimal side effects.

Among all formulations, Batch 2 was found to be the optimized batch due to better flow properties, faster disintegration time, and acceptable moisture content.

10. Conclusion: -

The present study successfully formulated and evaluated polyherbal green tea granules for the management of obesity. The prepared formulation showed good physical properties, and rapid dissolution, indicating its suitability for oral use. Evaluation parameters such as flow properties, moisture content, and pH were found within acceptable limits. The formulation exhibited promising anti-obesity potential due to the presence of

bioactive compounds like flavonoids and polyphenols. *Camellia sinensis* enhances fat oxidation, while *Garcinia cambogia* reduces fat synthesis and suppresses appetite. Other ingredients support digestion and metabolism. Together, these herbs act on multiple pathways, producing a greater combined effect than individual components alone.

Hence, the optimized batch can be considered stable, effective, and suitable for further development.

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