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Formulation of Gummy Containing Ginger & Vitamin's

Vaibhav
Research Scholar
Department of Pharmaceutics
Roorkee College of Pharmacy, Roorkee
Email: tyagivaibhav88@gmail.com

Vikas Dhawan
Co-guide
Department of Pharmaceutics
Roorkee College of Pharmacy, Roorkee

Vipin Kukkar
Director
Department of Pharmaceutics
Roorkee College of Pharmacy, Roorkee

Brahma Prakash Gupta
Assistant Manager
QA Department
Akums Drugs & Pharmaceutical, Haridwar

Reference to this paper should be made as follows:

Vaibhav,
Vipin Kukkar,
Vikas Dhawan
Brahma Prakash Gupta

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Abstract

Vitamin gummies have gained popularity in recent years due to their ease of swallowing, appealing appearance, and tasty flavors. Water-soluble vitamins such as vitamin B6 and vitamin B12 are susceptible to degradation when exposed to oxygen, moisture, light, heat, and changes in pH during manufacturing and shelf life. Therefore, it is essential to improve vitamin stability and delay the degradation process. This study aims to develop a gummy of ginger with vitamins to prevent nausea and vomiting during pregnancy. The optimized formulation showed good physical characteristics, such as hardness, and thickness.

Keywords

Gummy, Ginger, Vitamins, Formulation.

Introduction

Gummy

Gummy candy also called Jelly candy, gummies, jelly fruit candy, and jellies is a broad category of gelatin-based chewable sweets. Gummi bears and Jelly beans are widely popular and are a well-known part of the sweets industry. Jelly candies are available in a wide variety of shapes, sizes, and flavors. Haribo (German Brand) is the original maker of gummy candies, The Gold-Bear gummy bears were made in 1920 in Bonn by their commercial jelly-making machines. The company has since expanded its jelly candy product line to include gummy frogs, gummy fruit, gummy mice and gummy dinosaurs, which are sold in stores and online around the world. Gummy candies are made mostly of corn syrup, sucrose, gelatin, starch and water. In addition, minor amounts of coloring and flavoring agents are used. Food acids such as citric acid and malic acid are also added to give a tart flavor to gummies. It is often that other gelling agents are used in place of gelatin to make gummy candies suitable for vegans or vegetarians, such as starch and pectin.

Different Shapes of Gummy

There are different shapes of gummy candy, here list of parts of jelly popular ones:

- Gummy bears
- Jelly bottles
- Jelly beans
- Fruit Jelly
- Lego gummy
- Worm gummies
- Gummy sharks
- Jelly rings

Advantage of Gummy

- Gummy can be given to those patients who have difficulty in swallowing.
- Keeping the gummy in contact with the oral cavity for a short period of time.
- It has a pleasant taste and it extends the time that a quantity of ingredients remains in the oral cavity to elicit a nutraceutical effect also, pharmacists can prepare gummy extemporaneously with minimal equipment and time.
- Easy to prepare with minimum amount of equipment and time.
- Do not require water intake for administration[1].

Ingredients used in the formulation of gummy

Ginger

Ginger, botanically known as Zingiber officinale Roscoe, belongs to the Zingiberaceae family, which encompasses 47 genera and 1400 species, including turmeric (Curcuma longa)

and cardamom (two main genera, Elettaria and Amomum.) The genus, Zingiber, contains 150 species; however, the only species extensively used for flavouring is Z. officinale[2]. It is grown from April to December at an optimal elevation between 300 and 900m[3] requiring a warm, humid climate while preferring light shade[4]. Ginger has been cultivated in southern Asian countries for over 3000 years and its discovery and value as a spice and medicinal plant has been well documented. Ginger has been mentioned in several places throughout history: "Round amongst them (the righteous in paradise) is passed vessels of silver and goblets made of glass… a cup, the admixture of which is ginger". One of the earliest references made was by Rabbi Benjamin Tudella from his travels between 1159 and 1173 A.D. who described the cultivation and trade of spices coming from the ancient port of Quilon, in the State of Kerala. The most significant event that changed the history of the spice trade was the landing of Vasco da Gama in 1498 on the west coast of India, Malabar Coast (Kerala)[5]. Additional documentation dating back to 1298 A.D. was found in Marco Polo's travelogue stating that good ginger grows here and is known by the name of Quilon ginger[6].

Uses

- Ginger has been used to help digestion and treat stomach upset, diarrhea, and nausea for more than 2,000 years. Ginger has also been used to help treat arthritis, colic, diarrhea, and heart conditions.
- It has been used to help treat the common cold, flu-like symptoms, headaches, and painful menstrual periods[7]

Vitamin B6 (Pyridoxine)

Vitamin B6 was first described in the 1930s by researchers in the UK. It is an essential nutrient, as it must be supplied by the diet, A wide range of foods provide vitamin B6, including both animal and plant sources. Common sources include whole grains, nuts, vegetables, bananas, and meat, Vitamin B6 is heat-stable, and therefore cooked foods do not lose their vitamin B6 content, Some vitamin B6 is produced by bacteria in the large intestine, although the rate of absorption from this source is not known. Symptomatic vitamin B6 deficiency, which typically involves anemia and a weakened immune system, is rare in developed countries, but subclinical low concentrations are fairly common. However, vitamin B6 deficiency is possible in patients with malabsorption syndromes such as coeliac disease or Crohn's disease Low vitamin B6 status is associated with cardiovascular disease and stroke, however, very high doses of vitamin B6 may be toxic and result in sensory neuropathy, but such high levels are rare unless supplements are given as treatment for specific conditions[8].

Uses

- Morning sickness. Vitamin B-6 might reduce the severity of morning sickness during pregnancy. If you have persistent nausea and vomiting, your pregnancy care provider might prescribe vitamin B-6 supplements.

- Premenstrual syndrome (PMS). There is some evidence that vitamin B-6 might reduce symptoms of PMS; however, these studies are considered to be low quality.
- Vitamin B6 may play a role in improving brain function and preventing Alzheimer's disease[9].

Vitamin B12

Vitamin B12, also known as cobalamin, is a water-soluble vitamin involved in metabolism. It is one of eight B vitamins. It is required by animals, which use it as a cofactor in DNA synthesis, and in both fatty acid and amino acid metabolism.It is important in the normal functioning of the nervous system via its role in the synthesis of myelin, and in the circulatory system in the maturation of red blood cells in the bone marrow.[10]

Uses

- Helps in the formation of red blood cells and prevents anemia
- It may support bone health and prevent osteoporosis
- It improves mood and symptoms of depression

Literature Review

Mustafa, Abid, Muhammad, et. al. 2023 concluded that these gummies was enhanced compliance in pediatrics, better taste, ease of administration, and increased palatability. By using, sucrose and sorbitol as sweeteners, Gelatin as a gelling agent, and citric acid as a preservative ingredient[11].

Khatode, R., Rutuja, et. al. 2022 reported that the formulation of Multivitamin Gummies by using Vitamin C and vitamin B2 (Riboflavin)as main ingredient, Agar gel of orange flavor is mixed with pure honey for the gel base &Citric acid, The gummy were evaluated for various parameters like Assay of vitamins, pH and Thickness[12].

Lemos, Teixeira, Edite, et. al. 2021 developed a gummy jellies using natural ingredients, without added sugars or additives, in two varieties: one including orange juice and slightly sweetened with honey (ORH) and the other including puree made from a mixture of berries (BEM)[13].

Smith, David J, 2020 provided that the reader with adequate knowledge and understanding of two key industries relevant to the research. Part one covers the current practices in mass manufacturing of gummy confectionery. In particular, the review focuses on the types of molding processes in the manufacturing of gummy confectionery to understand both the best practices and limitations of current molding processes. Part two covers relevant literature about injection molding to understand the uses, capabilities and best practices within that sector[14].

Aim of Study

- To formulate and evaluate the analytical results of gummy containing Ginger Vitamin B6 & Vitamin B12 to reduce the nausea and vomiting by stimulating the CNS and improving the immune system.

Material & Method

Material Information

Table No -1

S. No.	Ingredient to be Used	Functional Category	Composition per Gummy
1.	Zingiber off, rhizome extract (5%gingerols)	Active Ingredient	28.12mg
2.	Vitamin B6 powder	Active Ingredient	4.80mg
3.	Vitamin B12 powder	Active Ingredient	4.80mg
4.	Liquid Glucose	Binding Agents	1722.04mg
5.	Crystalline Sugar	Sweetener	1966.40
6.	Gelatin	Gelling agent	161.94
7.	Citric acid monohydrate	Acidity regulator	60.36
8.	Liquid essence ginger water-soluble flavor	Flavor	28.60
9.	Colour Caramel	Color	22.94
			Total = 4gm

Equipments Used

1. Sugar Preparation tank
2. Glucose storage tank
3. Pectin tank
4. Vacuum cooker
5. Gummy depositor machine
6. Depositing Mold
7. Stirrer

The Procedure of Preparation

- Take purified water into a main manufacturing (tank-1) and heat it up to 90°C - 100°C.
- Add Sugar to the main manufacturing tank under continued stirring and stir for 5-15min or till cleared solution obtained
- Add glucose in the main manufacturing tank under continued stirring and stir for 5-20min or till a cleared solution obtained
- Take purified water into a main manufacturing tank-2 and heat it up to 90°C - 110°C

- Take purified water in tank 2 and heat it up to 90°C - 110°C.
- Add gelatin in main manufacturing tank -2 under continued stirring and stir for 5-10 or till lumps free solution obtained
- Transfer both tank1-2 to the vacuum cooker
- Check the pH above the solution it should be within the range (3.5 to 4.9).
- Cool down the above solution temperature from 65°C to 70°C.
- Add flavor in the main manufacturing tank under continued stirring and stir for 5-10min
- Add colour in hot water mix properly and filter it and then directly mix it into the manufacturing tank-l
- Add citric acid in the main manufacturing tank under continuous stirring and stir for 5-10 minutes or till translucent paste is obtained.
- Continue slow stirring until the solution is filled in molds
- Now pour the solution into molds.
- Demoulding the gummy and transferring the gummy to the drying area temp25±2^{0}C then collecting finished sample.

Preformulation Studies for Gummy

This is the first step in the rational development of the dosage form of a Gummy. This is the process for optimizing the delivery of nutrients through the determination of physiochemical properties of excipients which affect performance and development of an efficacious, stable, and safe dosage form. It also provides a framework for the active ingredient combination with excipients in the dosage form.

- **Description**

Take 5 gummies in a petri dish and observe for color and physical appearance shall be randomly checked to ensure that gummies are similar to each other.

- **Thickness**

Thickness shall be measured using Vernier calipers. It shall be determined by checking the thickness of ten gummy pieces in each formulation.

- **pH**

Cut the gummies into small pieces, Transfer about 15.0g of cut gummies into a 50 ml beaker add 15 ml hot water and stir for about 15 minutes at 60^{0}C temperature and cool, Adjust the temperature of the solution to 25^{0}C ± 2^{0}C, Immerse the electrodes in the solution and measure the pH.

- **Average Weight**

By using an analytical weighing balance weigh 20 gummies from composite sample and calculate the average weight.

Average weight = weight of 20 gummies (sum of all individual gummies)/20

- **Uniformity of Weight**

Uniformity of content studies is an essential step in the quality content of gummy products, It ensures that all gummies are within a tolerance of their average weight, for uniformity tests take approx. 20 gummies and weigh individually.

- **Moisture Content**

It is essential to calculate the weight loss of the sample and represent the moisture content of the sample, Moisture contents in gummies are used as a quality factor to prevent crystallization and to ensure that the gummy gets the extract toughness.

- **Assay of Vitamin B6**

Assay of vitamin B6 analyzed by HPLC by using standard solution and diluent.

- **Assay of Vitamin B12**

Assay of vitamin B6 analyzed by HPLC by using standard solution and diluent.

Results

The results of these study mentioned in the below table

Table no -2

S. No.	Tests	Results
1.	Description	Dark brown colored, bear shape, soft gummies with a characteristic odour
2.	Thickness	8.70mm
3.	pH	3.02
4.	Average weight	4.56g
5.	Uniformity of weight	-6.69% to + 3.04%
6.	Moisture content	11.65%
7.	Assay of Vitamin B6	3.40 mg
8.	Assay of Vitamin B12	3.60mg

Conclusion

This study found that it is possible to make gelatin-based gummies. It also establishes a framework for the active ingredient's combination with excipients in dosage form. It was also determined that it was possible to add vitamins to those gummies, allowing A person can swallow nutraceutical formulations in a fun and easy way. Many people prefer gummy vitamins to capsules because they are easier to swallow, taste better, and have no distinct odor. They may encourage people to take vitamins regularly and the results of gummy formulation found satisfactory according to composition

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