

**A REVIEW ON HERBAL GUMMIES FOR ANTIDIABETIC EFFECT****\*Disha Gupta, Sejal Ghadge, Rakshanda Raisoni**

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**ABSTRACT**

Diabetes mellitus, a worldwide health issue that is especially common in India, requires creative approaches to treatment. The goal of gummies is to offer a natural, tasty, and practical substitute for conventional herbal treatments. A novel and promising approach to diabetic management is the use of herbal anti-diabetic gummies. Natural substance found in herbs aid in blood sugar regulation. The hypoglycemic and antioxidant qualities of gummies made with herbal extract make them useful for managing diabetes mellitus. The goal of the gummies is for offer a natural, tasty, and practical substitute for conventional herbal treatments. Diabetic mellitus, a worldwide health issue that is especially common in India, requires creative approaches to treatment. A novel and promising

approaches to diabetes management is the use of herbal anti-diabetic gummies. Natural substance found in herbs aid in blood sugar regulation. The hypoglycemic and antioxidant qualities of gummies made with herbal extract make them useful for managing diabetes mellitus. To increase patient compliance and palatability, the herbal extract is combined with natural ingredients. a number of physiochemical characteristics of the gummies were assessed, including; content of moisture, uniformity of weight, hardness, PH, Uniformity of dosing content, Organoleptic properties such as color, taste, and texture were also assessed. This formulation approach offers a platform for improving patient compliance, particularly among populations that have trouble swallowing traditional tablets, in traditional herbal medicines into contemporary dosage forms.

**KEYWORDS:** Diabetes mellitus, Gummies, Herbal drugs.

## INTRODUCTION

Allopathic medicines used to treat diabetes have negative side effects of their own, such as constipation, diarrhea, flatulence, nausea, vomiting, hyponatremia, or hypoglycemia, headache, weight gain, lactic acidosis, pernicious anemia, dyspepsia, dizziness and joint pain.

Therefore, herbal medicines are a fantastic alternative to allopathic medications, having more or less negative effects and side effects (Kokar and Mantha, 1998). Information about ethnobotany found approximately 800 Indian plants that might have antidiabetic properties (Gupta *et al.*, 1986).

All the herbs formulation was purchased from nearby, genuine herb suppliers who specialized in selling of therapeutic plants and administered as over-the-counter Ayurvedic medicines by the Ayurvedic specialist. Even so, scientific evidence supports the popularity of complementary and alternative medicine (CAM) treatments. They are rarely used in the treatment of diabetes (Tripathi K.D., 2007). Prior studies on CAM diabetes has mostly concentrated on individual modalities, but CAM practitioners more frequently recommended intricate, multidietary intervention. Ayurvedic treatments could help individuals with higher baseline HbA1c value, which calls for additional investigation (Yadav *et al.*, 2002).<sup>[1]</sup>

## HERBS

The English word "herb" originates from the Latin word *herba* and the ancient French word *herbe*. In modern usage, this term refers to any part of a plant—including leaves, roots, stems, bark, flowers, seeds, or fruits—that is used for its therapeutic or medicinal properties. While the term was formerly used mainly to describe non-woody plants, it now encompasses a wide range of plant materials derived from trees, shrubs, and herbaceous species.

Many herbs possess significant antidiabetic properties that are valuable in managing diabetes. These herbs help regulate blood glucose levels through various mechanisms, such as boosting insulin secretion, enhancing insulin sensitivity, delaying glucose absorption, and reducing oxidative stress. Furthermore, certain herbs booster the immune system and enhance overall metabolic balance, offering significant benefits for chronic conditions such as diabetes. Certain herbs are known as "blood purifiers" due to their ability to detoxify the body. These could aid in enhancing physiological functions and eliminating metabolic toxins. Some herbs also help strengthen the immune system and reduce complications associated with diabetes. Cinnamon, ginseng, fenugreek, bitter melon, and gymnema are among the commonly used

medicinal herbs that may exhibit antidiabetic effects. These herbs are increasingly incorporated into innovative dosage forms such as gummies to enhance patient acceptability and compliance.<sup>[2]</sup>

### TYPES OF HERBAL GUMMIES

**1. For stress and Sleep:** Gummies with ashwagandha (adaptogen, lowers stress) Gummies with valerian root (promotes sleep) Gummies made with chamomile (calming, helpful with anxiety and sleep) Gummies with lavender (relaxation)

**2. For Immunity:** Elderberry candies (boosting the immune system) Echinacea gummies (to prevent colds and the flu) Gummies with turmeric and ginger (anti-inflammatory, immunological support).

**3. For Digestion:** Ginger gummies (help with digestion, alleviate nausea) Gummies with peppermint (calms the stomach) Gummies made from licorice root (gut health).

**4. For Energy and Focus:** Ginseng gummies (improves mental clarity and vitality).<sup>[3]</sup>

**5. For Diabetes:** Paneer Doda Gummies (manage Diabetes, Improves Digestive Health), Star Fruit Gummies (Helps Prevents Blood sugar spikes), Noni Fruit Gummies (Reduce Insulin Resistance).<sup>[4]</sup>

### DIABETES MELLITUS

Diabetes mellitus (DM) is a long-term metabolic disease marked by hyperglycemia and an insulin shortage. The symptoms of polyurea (frequent urination), polyphagia (excessive hunger), and polydipsia (excessive thirst) are caused by the metabolic imbalances. Long-term untreated diabetes may result in myocardial infarction, gangrene, retinopathy, and occasionally elevated blood pressure. Diabetes mellitus is a term used to describe a group of metabolic disorders that are typified by consistently elevated blood sugar levels. The reason behind it is reduced efficacy of insulin or reduced secretion of insulin, or often both.<sup>[5]</sup>

### DIABETIC MELLITUS TYPES

#### 1. DIABETES TYPE 1

It is Insulin – dependent diabetes mellitus (IDDM) also known as a juvenile onset diabetes mellitus. In this state, killed cells in the pancreas that produce insulin. Patients must insulin treatment for life. It starts in youth or early adulthood.<sup>[5]</sup>

## 2. DIABETIC TYPE 2

It is Noninsulin-dependent diabetes mellitus (NIDDM) maturity onset diabetes mellitus. The most prevalent kinds. In this instance, the body either generates insufficient insulin or the cells become resistant to insulin. Typically developing in adults, it is increasingly prevalent in children as a consequence of dietary and lifestyle decisions. Nutrition, physical activity, oral drugs and sometimes insulin are utilized to control it.<sup>[5]</sup>

### SYMPTOMS OF DIABETES

- A rise in hunger and thirst
- Regular urination
- Exhaustion
- Vision blurriness
- Slow healing of wounds and cuts
- Numbness or tingling in the hands and feet.<sup>[6]</sup>

### MECHANISM OF ACTION OF HERBAL ANTIDIABETIC

Herbal Antidiabetics' Mode of Action Herbs have antidiabetic properties through a number of different methods. Herbal anti-diabetic agents' modes of action can be categorized as follows:

- cAMP (second messenger) stimulation, pancreatic beta cell potassium channel blockage, and adrenomimeticism. Renal glucose reabsorption inhibition
- Inhibition of insulin degradation mechanisms
- stimulation of insulin production from islet beta cells
- A decrease in insulin resistance
- Supplying certain elements that beta cells require, such as calcium, zinc, magnesium, manganese, and copper
- Pancreatic beta cell regeneration and/or repair
- Increasing the islets of Langerhans' cell size and quantity
- Increased secretion of insulin
- Hepatic glycolysis and glycogenesis stimulation
- Preventive impact on beta cell death
- Better digestion along with lower blood sugar and urea levels
- Preventing the abnormal conversion of starch to glucose
- Inhibition of  $\alpha$ -glucosidase and  $\beta$ -galactosidase
- Activities that reduce cortisol

- Alpha-amylase<sup>6</sup> inhibition.<sup>[7]</sup>

### **EFFICACY OF HERBAL ANTIDIABETIC COMPOUND**

**Variable efficacy:** Depending on the particular compound, the effectiveness of herbal anti-diabetic compounds can vary. dosage, as well as each patient's reaction.

**Mechanisms of action:** There are several ways that herbal compounds can work, including

- Increasing the secretion of insulin
- Increasing sensitivity to insulin
- Preventing the liver from producing glucose
- Improving the absorption of glucose in muscles and adipose tissue

**Potency:** Certain herbal substances have demonstrated strong anti-diabetic effects that are on par with those of prescription drugs.

**Synergy:** Herbal compound combinations may have synergistic effects that increase their effectiveness.

**Standardization:** To guarantee constant safety and effectiveness, herbal products must be standardized.

**Clinical evidence:** Research on a few herbal compounds has shown encouraging outcomes in clinical trials.

**Possible interactions:** Conventional medications, such as anti-diabetic medications, may interact with herbal compounds.

**Safety:** Although herbal compounds are generally regarded as safe, they may have negative effects or interact with other drugs.

**Regulation:** Each nation has different laws governing herbal products, and there may be inconsistent quality control.

**Patient education:** Patients should be informed about how to use herbal anti-diabetic medications correctly and about any possible interactions.<sup>[6]</sup>

## FORMULATION TECHNIQUES OF GUMMIES

Gummy formulation method: In order to get the desired texture, flavor, and functionality, ingredients are combined in gummy formulation procedures. Key points regarding anti-diabetic gummy formulation strategies are as follows:

1. **Gelation agents:** To get the gummy texture, use natural gelation agents like carrageenan, agar, or gelatin.
2. **Sweeteners:** To reduce the amount of sugar, use low-calorie sweeteners like xylitol, erythritol, or stevia.
3. **Flavorings:** To improve flavor, use natural flavorings such as fruit extracts or essential oils.
4. **Active ingredients:** Use anti-diabetic herbal substances such as cinnamon extract, berberine, or gymnemic acid.
5. **pH control:** Modify pH values to maximize active ingredient stability and bioavailability.
6. **Texture modification:** To get the appropriate chewiness or firmness, add texture modifiers such as gum arabic or pectin.
7. **Colorants:** To achieve eye-catching hues, use natural colorants like turmeric or beetroot powder.
8. **Preservatives:** To increase shelf life, use natural preservatives like vitamin E or rosemary extract.
9. **Encapsulation:** To encapsulate delicate substances, use methods like freeze-drying or spray drying.
10. **Manufacturing techniques:** To produce gummies with exact control over size, shape, and texture, use techniques like extrusion, injection molding, or compression.<sup>[6]</sup>

## PALATIBILITY AND CONSUMER ACCEPTANCE

When developing anti-diabetic gummies, palatability and consumer acceptability are important considerations.

### Palatability

1. **Taste:** The taste of anti-diabetic gummies should be pleasant, covering up any harsh or disagreeable flavors of the active substances.
2. **Feel:** The gummies should melt easily in the mouth and have a pleasing feel that is neither too soft nor too hard.
3. **Mouthfeel:** The gummies shouldn't leave the mouth feeling dry or sticky.

### Consumers Acceptance

1. **Convenience:** Anti-diabetic gummies should be simple to use and work with a hectic schedule.
2. **Efficacy:** Customers should believe that the gummies are useful for controlling blood sugar levels.
3. **Natural ingredients:** Gummies with natural components and no artificial additives may be preferred by consumers.
4. **Sugar content:** Low-sugar or sugar-free gummies are preferred because consumers may be worried about sugar level.
5. **Packaging:** Consumer acceptance can be influenced by appealing and practical packaging.
6. **Brand reputation:** Gummies from respectable companies with a track record of manufacturing high-quality goods may be preferred by consumers.
7. **Cost:** When choosing whether or not to buy the gummies, consumers may take their cost into account.
8. **Suggestions:** Before attempting anti-diabetic gummies, consumers may consult medical experts or internet evaluations.

### In order to guarantee consumer approval and palatability, manufacturers can

1. **Sensory testing:** To improve the formulation, conduct texture analysis and taste panels.
2. **Customer surveys:** To learn about the preferences and problems of customers, conduct questionnaires.
3. **Market research:** Learn about consumer preferences and behavior by conducting market research.
4. **Product testing:** To prove safety and effectiveness, carry out clinical trials.

Manufacturers can create anti-diabetic candies that are both successful and consumer-friendly by taking these things into account.<sup>[6]</sup>

### LIMITATIONS

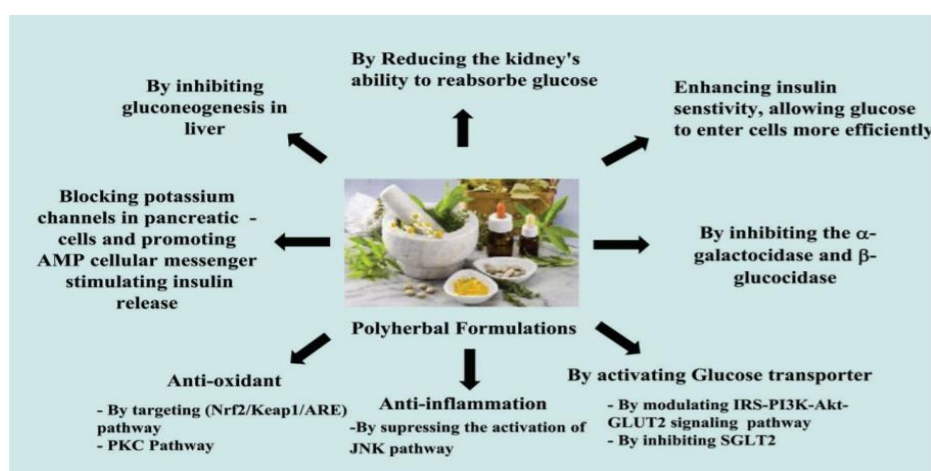
- **Efficacy:** Making sure blood sugar levels are consistently managed effectively.
- **Standardization:** Ensuring that each gummy contains the same quantity of active ingredients.
- **Bioavailability:** Ensuring that the active components are efficiently absorbed by the body.

- Regulation: Handling dietary supplement regulations.
- Consumer education: Teaching customers about appropriate usage and expectations.
- Quality control: Ensuring uniform quality throughout production processes and batches.
- Stability: Making sure the candies stay strong and stable for the duration of their shelf life.
- Interactions: Possible drug or medical condition interactions.<sup>[6]</sup>

## CHALLENGES

Anti-diabetic gummies shouldn't be used in place of prescription drugs without speaking with a medical expert.

- Individual outcomes may differ: Depending on personal factors like diet and lifestyle, efficacy may differ.
- Limited scientific evidence: To completely comprehend the effects of anti-diabetic gummies, more research is required.
- Possible adverse effects: Some users might have allergic reactions or digestive problems.
- Ingredient dependence: The consistency and quality of the ingredients determine both efficacy and quality utilized.
- Shelf life: Gummies may lose their potency over time and have a short shelf life.
- Storage and handling: To preserve quality, storage and handling must be done correctly.<sup>[6]</sup>



**Figure No. 1: Polyherbal Formulations showing Anti Diabetic Effect by Various Mechanism.**<sup>[8]</sup>

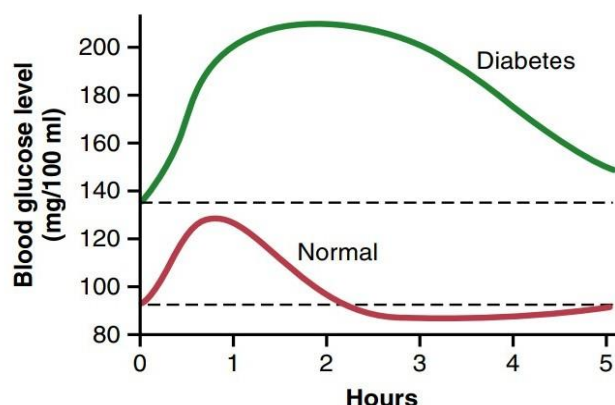


Figure No. 2: Glucose tolerance curve in a normal person and in a person with diabetes.<sup>[9]</sup>

## MATERIALS

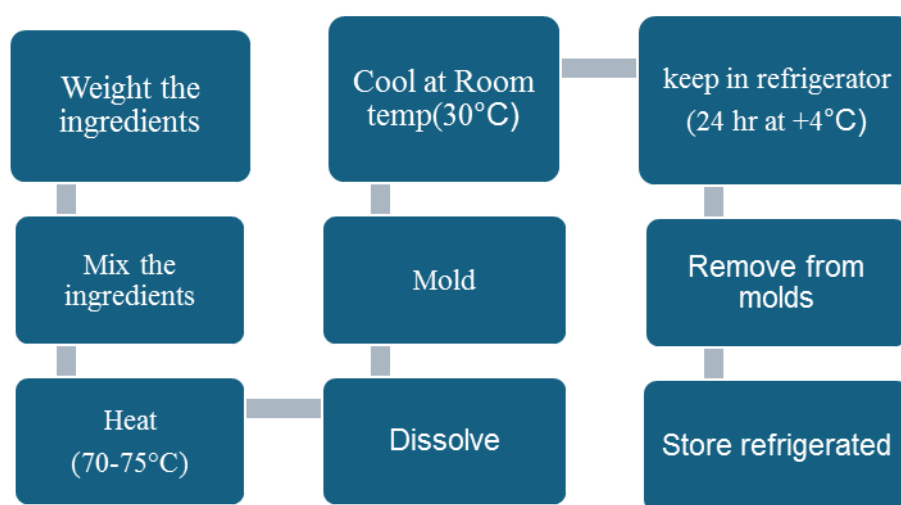
SR NO.	COMMON NAME	BOTANICAL NAME	ROLE OF INGREDIENTS
1	Aloe vera	<i>Aloe barbadensis</i> Miller	Anti-diabetic, anti-inflammatory <sup>[10,11,8,7]</sup>
2	Fiery costus	<i>Chamaecostus</i> <i>cuspidatus</i>	Leaves are known for strengthening pancreatic beta cell and assisting in sugar metabolism <sup>[12]</sup>
3	Tulsi	<i>Ocimum sanctum</i>	Regulate blood sugar <sup>[13,10,8]</sup>
4	Garlic	<i>Allium sativum</i>	Manage high blood pressure <sup>[10,7]</sup>
5	Acacia	<i>Acacia nilotica</i>	Reduce blood sugar level <sup>[10]</sup>
6	Sugar apple	<i>Annona squamosa</i>	Reduce blood sugar level <sup>[10,7]</sup>
7	Mango	<i>Mangifera indica</i>	Treat diabetes condition <sup>[10,11,8,7]</sup>
8	Neem	<i>Azadirachta indica</i>	Blood sugar regulation <sup>[10,8,7]</sup>
9	Karela	<i>Momordica</i> <i>charantia</i>	Treat diabetes mellitus <sup>[13,10,11,8]</sup>
10	Brahmi	<i>Bacopa monniera</i>	Improves insulin sensitivity <sup>[11]</sup>
11	Jamun Seeds	<i>Syzygium cumini</i>	Reduce diabetes <sup>[13,10,11,8]</sup>
12	Papaya	<i>Carica papaya</i>	Lower fasting blood sugar <sup>[10]</sup>
13	Fenugreek seeds	<i>Trigonella</i> <i>foenum-graecum</i>	Anti diabetic properties <sup>[13,8,7]</sup>
14	Onion	<i>Allium cepa</i>	Stimulate effect on glucose utilization and anti-oxidant enzyme <sup>[10]</sup>
15	Tejpatta	<i>Cinnamomum</i> <i>tamala</i>	Provide health benefits, prevent digestive trouble, reduce blood sugar level <sup>[10,11]</sup>
16	Babul wood	<i>Vachellia nilotica</i>	Reduce blood glucose, triglycerides and cholesterol <sup>[7]</sup>
17	Gulvel	<i>Tinospora</i> <i>cordifolia</i>	Regulate blood sugar level <sup>[11]</sup>
18	Yam	<i>Dioscorea alata</i>	Protect against diabetes <sup>[11]</sup>
19	Alsi seeds	<i>Linum</i> <i>usitatissimum</i>	Regulate functioning of glucose-6-phosphate dehydrogenase <sup>[8]</sup>
20	Amla	<i>Phyllanthus emblica</i>	Manage blood sugar level <sup>[11]</sup>
21	Cinnamon	<i>Cinnamomum</i>	Hypoglycemic effect, reduce blood glucose level <sup>[10,8]</sup>

		<i>verum</i>	
22	<b>Insulin plant leaf</b>	<i>Costus igneus</i>	Anti-hyperglycemic, hypoglycemic and hypolipidemic <sup>[8]</sup>
23	<b>Green tea</b>	<i>Camellia sinesis</i>	Protect against oxidative stress <sup>[11,8]</sup>
24	<b>Choti elaichi</b>	<i>Elettaria cardamomum</i>	Enhance insulin sensitivity, regulate and lower blood glucose level <sup>[8]</sup>
25	<b>Vijaysar wood</b>	<i>Pterocarpus marsupium</i>	Reduce blood sugar level <sup>[8]</sup>
26	<b>Ladyfinger</b>	<i>Abelmoschus esculentus</i>	Reduce carbohydrate metabolizing enzymes, increases insulin sensitivity <sup>[8]</sup>
27	<b>Moringa</b>	<i>Moringa oleifera</i>	Reduce Blood glucose level, Improve Insulin sensitivity and controlling Oxidative stress <sup>[14]</sup>
28	<b>Guava leaf</b>	<i>Psidium guajava</i>	Anti-hyperglycemic and hyperlipidemic action <sup>[8]</sup>
29	<b>Vinca leaf</b>	<i>Vinca rosea</i>	Hypoglycemic activity. <sup>[8]</sup>
30	<b>Javitri</b>	<i>Myristica fragrans</i>	Enhance the lipid per oxidation and insulin metabolism <sup>[8]</sup>
31	<b>Gudmar leaf</b>	<i>Gymnema sylvestre</i>	Inhibit glucose absorption in intestine <sup>[10,8]</sup>
32	<b>Turmeric</b>	<i>Curcuma Longa</i>	Helps to reduce Blood glucose level, Antioxidant, Anti-inflammatory effect <sup>[13,10,11]</sup>
33	<b>Guduchi</b>	<i>Tinospora Cordifolia</i>	Antidiabetic Property, Hypoglycemic activity <sup>[11]</sup>
34	<b>Ginger</b>	<i>Zingiber-officinale</i>	Antidiabetic Property, Hypotency, Anti cancer agent <sup>[11]</sup>
35	<b>Kidney beans</b>	<i>Phaseolus Vulgare</i>	Control blood glucose level <sup>[15]</sup>
36	<b>Flaxseeds</b>	<i>Linum usitatissimum</i>	Hypoglycemic properties <sup>[15]</sup>
37	<b>Pumpkin Seeds</b>	<i>Curcubita pepo</i>	Insulin Regulation and Glucose metabolism and hypoglycemic property <sup>[7]</sup>
38	<b>Fennel</b>	<i>Foeniculum vulgare</i>	Regulation in Blood glucose level, Antioxidant property <sup>[7]</sup>
39	<b>Perun-kurinjan</b>	<i>Gymnema sylvestre</i>	Maintain blood Glucose level <sup>[7]</sup>
40	<b>Kundumani</b>	<i>Abrus precatorius</i>	Shows Anti-diabetic activity <sup>[7]</sup>
41	<b>Nigella</b>	<i>Nigella sativa</i>	Improves insulin sensitivity, reduce Blood glucose level and Antioxidant effect <sup>[10,7]</sup>
42	<b>Bael</b>	<i>Aegle marmelos</i>	Improves functional state of pancreatic beta cells <sup>[10]</sup>
43	<b>Ankol</b>	<i>Alangium salvifolium</i>	Enhance Glucose transporter expression and reduce insulin resistance <sup>[16]</sup>

### METHOD OF PREPARATION OF GUMMIES

1. To make gummies, two distinct solutions must be made: one with water and stevia and another with gelatin and water.
2. Put water and stevia in a beaker. Using a glass stirrer, this mixture is heated to medium-high.
3. Make sure the temperature stays below 130°C by adjusting it.
4. Keep heating until a transparent solution is obtained.

5. Gently heat the gelatin and water in a separate beaker for a few minutes
6. Next, add the heated stevia solution to the gelatin mixture, thoroughly stir, and briefly heat the mixture to 70°C.
7. Stir the liquid to create a homogenous solution to add different amounts of plant extracts. Next, add preservatives and flavoring agent.
8. On keep the silicone mold from adhering, apply glycerine on it. To level the fillings, pour the heated mixture into the mold and tap it on the shelf.
9. Clear the mold of any extra solution.
10. Give the mold sixty minutes to sit at room temperature in a secure location.<sup>[4]</sup>



## EVALUATION PARAMETERS

### 1. PHYSICAL EVALUATION

The medicated jelly was examined for its physical characteristics such as colour, odour, appearance, clarity, and transparency. The formulation was visually inspected under normal light conditions to ensure uniformity and absence of air bubbles, lumps, or any particulate matter. The texture and overall aesthetic acceptability of the jelly were also noted.<sup>[3]</sup>

### 2. STICKINESS AND GRITINESS

The texture of the medicated jelly in terms of stickiness and grittiness was evaluated manually by gently rubbing a small quantity of jelly between the fingers. Stickiness indicates the adhesive nature of the formulation, while grittiness indicates the presence of undissolved particles. An ideal jelly should be smooth, non-gritty, and non-sticky.<sup>[3]</sup>

### 3. PH DETERMINATION

The pH of the jelly was determined using a calibrated digital pH meter. A small portion of the jelly was dispersed in distilled water and the electrode was dipped into the sample. The pH was recorded once the reading stabilized. The pH of the formulation should be within an acceptable range (generally 3–4.5 for gummies or near neutral depending on application) to ensure stability, safety, and patient acceptability.<sup>[3]</sup>

### 4. WEIGHT VARIATION

Weight variation test was performed by weighing 10 individual gummies using a digital balance. The average weight was calculated and standard deviation was determined. This test ensures uniformity of dosage units and consistency in the manufacturing process.<sup>[3]</sup>

### 5. MOISTURE CONTENT

The moisture content of the jelly was determined by drying accurately weighed, finely ground samples (about 10 g) in a hot air oven at 105°C until a constant weight was obtained. The loss in weight was calculated as percentage moisture content. This parameter is important for stability, texture, and prevention of microbial growth.

$$\text{Moisture \%} = \frac{[(W+W1)-W2] \times 100}{W}$$

Where, W= weight of sample (gm)

W1= weight of petri dish (gm)

W2= weight of petri dish with sample after drying (gm).<sup>[3]</sup>

### 6. SPREDABILITY

Spreadability of the jelly was determined by placing a known quantity of jelly between two glass slides. A weight of 1000 g was placed over the slides for 5 minutes to allow uniform spreading. The diameter (or radius) of the spread jelly was measured, and the spreading area was calculated using the formula:

$$A = \pi r^2, \text{ This test indicates the ease of application and consistency of the jelly.}^{[3]}$$

### 7. STABILITY STUDY

The stability study of the formulation was carried out by storing the medicated jelly at room temperature (25–30°C) for a period of 4 weeks. During this period, samples were evaluated at

regular intervals for changes in physical appearance, pH, texture, colour, odour, and overall acceptability. This study helps in determining the shelf-life and stability of the formulation.<sup>[3]</sup>

## 8. TEST OF MOUTH DISSOLVING TIME

The amount of time it takes for the candy to dissolve entirely determined by the USP apparatus for disintegration, where hard-boiled candies Lozenges were inserted into each apparatus tube. and how long it takes for the lozenges to dissolve was fully observed using the McIlvaine buffer of pH 6.4 at 37°C.<sup>[12]</sup>

## 9. ASH CONTENT

AOAC determined the ash content of the sample. 942.05 technique. To determine the amount of ash content, we weigh three silica crucibles. Each crucible received a 5 g sample. Following the elimination of moisture, the samples were utilized to determine ash. The crucible featuring the sample was maintained at 400°C in a muffle furnace temperature for three to four hours, or until the ash was acquired. The crucible was then cooled in a desiccator and weighed. The amount of ash was stated as a percentage. Ash content of the samples was calculated using the formula below:

$$\text{Ash (\%)} = \frac{W2 - W1}{100}$$

Where, W1= Initial weight (gm)

W2= Loss in Weight (gm)<sup>[12]</sup>

## 10. ORGANOLEPTIC PROPERTIES

### 1. COLOUR

The color should be uniform and attractive natural color often used (beetroot, turmeric, etc.)

### 2. ODOUR

Odour should pleasant and neutral herbal ingredients may have strong odours so there is necessity of flavoring.

### 3. TASTE

Taste is evaluated by sensory panel diabetic friendly sweeteners like erythritol, stevia are used. Sweeteners are used to mask the bitter taste of gummies.

### 4. TEXTURE

It should be crack free smooth and non-sticky and easy to chew.

## 5. APPEARANCE

Gummy should have uniform shape, surface finish, no crack, and glossy surface.<sup>[3]</sup>

## 11. SYNERESIS TEST

When water is extracted or expelled from a contracting or shrinking structure, syneresis takes place, which could lower the quality of the material. The samples were weighed in order to conduct this test at room temperature ( $25 \pm 5^\circ\text{C}$ ). The final weights of the preparations were first noted after an absorbent paper was affixed to each gummy's surface. Syneresis is indicated by a considerable difference between the initial and final weights (% syneresis =  $\frac{\text{start weight} - \text{final weight}}{\text{final weight}}$ ).<sup>[4]</sup>

## 12. THICKNESS TEST

The vernier callipers are used to measure the gummy thickness, and the thickness of each recipe is tested.<sup>[4]</sup>

## 13. PHYTOCHEMICAL TEST

### TEST FOR CARBOHYDRATE

A few drops of alcoholic alpha naphthol were added to 0.5 ml of aqueous PHP solution in order to perform the molish test. after which 0.2 ml of concentrated sulphuric acid was added along to the test tube sides. the presence of carbohydrates was confirmed by the presence of a reddishviolet at the junction.<sup>[11]</sup>

### TEST FOR FLAVONOIDS

By mixing 1ml of aqueous PHP solution with 5ml of diluted ammonia, Flavonoids were found. Addition of sulphuric acid that has been concentrated. Flavonoids were detected by the presence of yellow colour.<sup>[11]</sup>

### TEST FOR TANNINS

The lead acetate test, which involved adding a few drops of 10% lead acetate to 0.5 ml of the PHP solution in water. Tannins are present because a precipitation formed.<sup>[11]</sup>

### PHENOLIC COMPOUND TEST

The aqueous PHP solution was mixed with a few drops of a 10% lead acetate solution, and phenolic compounds, as evidenced by the white precipitate that formed. A small amount of neutral 5% ferric chloride drops. 0.5 ml of aqueous PHP solution was mixed with the solution. Phenolic compounds were found to be present by the development of dark green.<sup>[11]</sup>

### TEST FOR AMINO ACID

A few drops of 5% ninhydrin were added to 0.5 ml of aqueous PHP solution to conduct the ninhydrin test. Boiling comes next. The presence of amino acids was indicated by the appearance of violet color. Proteins were found using the Biuret test, which added 4% sodium hydroxide to 0.5 ml of an aqueous PHP solution followed by a few drops of a 1% copper sulphate solution. The presence of protein was demonstrated by the appearance of the color violet.<sup>[11]</sup>

### CONCLUSION

The hypoglycemic action of polyherbal powder was demonstrated in the current study. Numerous chemical substance found in plant leaves have the ability to produce a variety of pharmacological activities through a variety of mechanism. These plants have historically been used to treat diabetes, and this polyherbal powder can used to make an effective formulation of polyherbal antidiabetic powder. Mixture can help people with diabetes. Because a plant source is used to make the formulation. The product is economically viable because all of the herbs used in this preparation are readily available throughout the year and are reasonably priced.

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