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Patient-Friendly Herbal Medicated Gummies for the Treatment of Insomnia

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Abstract: Difficulty in falling asleep or maintaining sleep—commonly known as insomnia—remains a prevalent health concern that negatively impacts a person's daily functioning and overall quality of life. While pharmaceutical interventions are commonly used, their long-term use is often hindered by side effects and reduced patient adherence. In light of this, the present investigation focused on formulating herbal gummies combining *Albizia lebbeck* bark extract and Kiwi (Actinidia deliciosa) extract, aiming to offer a safer, natural, and enjoyable option for individuals seeking relief from sleep-related issues. The formulation was built around key phytochemicals—quercetin, kaempferol, and melatonin—recognized for their calming and free-radical-neutralizing properties. Both plant materials were extracted using water as solvent and subsequently tested for phytochemical composition, which verified the presence of alkaloids, flavonoids, saponins, and tannins. Gelatin served as the structural gelling component of the gummies, while honey was included for its natural sweetness and preservative qualities. To understand how the identified compounds might interact with sleep-regulating receptors, computational docking was performed using PyRx software (AutoDock Vina), focusing on Orexin-2, MT1, and MT2 receptor targets. Quality assessment of the gummies—covering pH, thickness, weight consistency, and physical durability—confirmed adherence to pharmacopeial benchmarks. Antioxidant evaluation using the DPPH assay demonstrated a rising trend in radical-scavenging activity, from 27.78% at 50 µg/mL up to 67.22% at 250 µg/ml. Overall, this Albizia-Kiwi gummy formulation proves to be stable, pleasant to consume, and rich in antioxidant and sleep-supporting potential, further validated by encouraging docking data—making it a credible natural approach to insomnia care.

Keywords: Insomnia, Albizia lebbeck bark, Kiwi, Herbal medicated gummies, Phytoconstituents, Molecular docking.

1. Introduction

Insomnia is a disease in which there is a Difficulties in initiating or maintaining sleep or early morning awakening, associated with impaired day time functions [1]. In this disease, the quality or quantity of sleep get affected. It impairs the consolidation of declarative memory, and this impairment involves an increase in cortisol levels and a decrease in slow – wave sleep [2]. It is expected to rise further in future due to our modern social lifestyles, working systems, i.e., night shift works, professional stress, occupations dependent on electronic gadgets, and excess usage of social media [3]. Primary sleep disorders as well as circadian rhythm disorders are frequently comorbid with and often lead to insomnia [4].

Fig: 1

Sleep is an essential biological function, which is crucial for neural development, learning & memory, emotional regulation, cardio vascular and metabolic function, as well as cellular toxin removal. Sleep is occupying 1/3rd part of the time in one's life [3].

Types:
The topic of insomnia, breaking it down into two main types:
- Primary insomnia
- Secondary insomnia[5]

Based on duration
- Acute insomnia
- Chronic insomnia[6]

2. Pathophysiology

Stress / emotional or environmental factors
↓
Increased arousal system activity
↓
Reduced ability of the brain to down-regulate arousal during night
↓
Reduced/altered GABAergic inhibitory activity
↓
Less inhibition of wake-promoting neurons
↓
Increased neuronal firing / cortical activity
↓
Increased brain arousal (Hyperarousal)
↓
Sleep initiation becomes difficult
↓
Difficulty maintaining sleep +
frequent awakenings
↓
INSOMNIA [7]

3. Causes Of Insomnia
- Stress & Life events
- Work pressure, financial issues, major life changes, and traumatic events
- Medical conditions
- Chronic pain, asthma, heart disease, diabetes, Parkinson's disease, & GERD
- Hormonal changes
- Pregnancy, menopause, thyroid, & other hormonal fluctuations

- Genetic predisposition
- Insomnia & sleep patterns can run in families
- Mental health disorders
- Anxiety, depression, & other mood disorders
- Poor habits
- Excessive caffeine or alcohol, smoking, heavy meals, or long daytime naps[8]

4. Symptoms of Insomnia

- Difficulty falling asleep
- Frequent night awakenings
- Waking up too early
- Mood changes
- Headaches&bodyaches
- Daytime fatigue
- Difficulty concentrating
- Reduced performance[9]

5. Treatment Approaches

- Addressing insomnia typically involves behavioural and medical strategies. The first-line approach is often cognitive behavioural therapy aimed at identifying and modifying thoughts and behaviours that perpetuate sleep problems. Techniques like sleep restriction, stimulus control, and maintaining a consistent sleep routine can be effective.
- In cases where behavioural methods are insufficient, medications such as certain sleeping pills, benzodiazepines, or newer agents like dual orexin receptor antagonists may be prescribed. It's important to consult healthcare providers for personalized treatment plans and to discuss potential side effects or interactions. Overall, lifestyle modifications and behavioural therapies are considered the safest, most sustainable options for improving sleep quality [10].

Gummies

6. Introduction

Gummies have emerged as a popular and effective medium for delivering health-enhancing compounds due to their enjoyable texture, appealing flavours, and versatile formulation capabilities. Beyond their traditional role as confectionery treats, functional gummies have transformed into innovative carriers that encapsulate bioactive ingredients aimed at improving well-being. Specifically, for managing insomnia, gummies present a convenient and palatable alternative to conventional supplements, making it easier for individuals to incorporate sleep-supportive herbal extracts and nutraceuticals into their daily routine. Their ability to maintain ingredient stability and ensure precise dosing positions gummies as a promising option in the growing market of natural sleep aids [11].

Fig:2

7. Types Of Gummies

There are various types of gummies used to deliver nutrients in food products, each with unique properties that affect how nutrients are released and absorbed by the body.

- Collagen-based gummies
- Plant-based gummies
- Emulsifiers

Collagen-based gummies

Collagen-Based Matrices Collagen, derived from animal sources, dissolves slowly in the digestive system. This slow breakdown results in a gradual liberation of nutrients, which can be beneficial for prolonged nutrient absorption. Additionally, collagen provides a chewy texture often found in gummy supplements. For example, collagen-based gummy vitamins release their nutrients steadily as they dissolve, making them ideal for sustained delivery.

Plant-based gummies:

Plant-Derived Matrices (Pectin) Pectin, a substance extracted from plants like apples and citrus fruits, dissolves more quickly compared to collagen. Despite this faster dissolution, it still effectively delivers nutrients to the body. Pectin is commonly used in vegan gummy vitamins, providing a plant-based alternative that meets dietary restrictions while ensuring efficient nutrient release.

Emulsifiers:

Emulsifiers are added to enhance the solubility of fat-soluble vitamins. Since vitamins such as A and E are not easily dissolved in water, emulsifiers help these vitamins mix better within the digestive tract, improving their absorption and bioavailability. For instance, the inclusion of emulsifiers in a vitamin supplement ensures that fat-soluble vitamins are more readily absorbed, increasing their effectiveness [12].

8. Mechanism of Action

Bioactive compounds (Saponins from Albizia bark + Serotonin, Tryptophan, Antioxidants from Kiwi)

↓

Increase brain GABA & Serotonin levels

↓

Enhanced GABAergic inhibitory activity (GABA-A receptor modulation) +

Serotonin conversion to Melatonin

↓

Reduced neuronal excitability & oxidative stress in brain

(antioxidant action combats hyperarousal-linked oxidative damage)

↓

Suppression of wake-promoting neuronal activity + Regulation of circadian rhythm

↓

Reduced CNS hyperarousal, Anxiolytic & Sedative effect

↓

Improved Sleep Onset, Sleep Duration & Sleep Efficiency

↓

RELIEF FROM INSOMNIA

9. Advantages

- Ease of consumption: Gummies are simple to take, especially for individuals who find swallowing pills challenging.
- Discretion and enjoyment: They resemble regular candies, allowing users to consume them privately without stigma.
- Customizable formulations: Gummies can incorporate various active ingredients—such as vitamins, herbal extracts, or minerals—enabling tailored health solutions.
- Palatability: The flavours make them more enjoyable compared to traditional medicine forms.
- Prolonged effect: When taken orally, active ingredients are released gradually, providing sustained benefits.

10. Disadvantages

- Dosing variability: Cutting or dividing gummies for smaller doses can be imprecise.
- Inconsistent potency: Manufacturing differences may lead to variability in herbal concentration.
- Risk of overconsumption: Their candy-like appeal can tempt overdose, especially in children or individuals with impulse control issues.
- Ingredient interactions: Components like gelatin may react negatively with certain medications[13].

11. Storage

1. Importance of Freezing Edibles

Prolongs Freshness: Freezing is an effective method to preserve the quality and potency of edibles over an extended period. Immediate Freezing Encouraged: To maintain peak freshness, it's best to freeze edibles as soon as possible after purchase or preparation.

2. Proper Packaging Techniques
- Use of Airtight Containers: To prevent freezer burn and odor transfer, place edibles in airtight containers designed for freezing.
- Individual Wrapping: For items like gummies, wrapping each piece individually minimizes sticking and makes portion control easier.

3. Advantages of Freezing Edibles
- Maintains Quality: Freezing helps keep edibles at their freshest, preserving flavour, texture, and potency.
- Long-term Storage: It enables you to store edibles for months without significant quality loss.
- Convenience: Future use becomes easy, allowing you to enjoy edibles at your convenience without worry about spoilage.

4. Additional Tips for Freezing
- Label the Package: Mark the date of freezing to keep track of storage time and ensure optimal freshness.
- Avoid Overcrowding: Properly space out items within the freezer to allow for even freezing and easy access [14].

Plant Profile:

Common name	Biological source	Family	Chemical constituents	Uses
Siris, woman's tongue tree	Albizia lebbeck	Fabaceae	Steroids, Albiziasaponin A,B,&C	Mental disorder, anxiety,earache
Kiwi fruit	Actinidia deliciosa	Actinidiaceae	Flavanoids, alkaloids,anthocyanin	Improve sleep,boost immune system
Gelatin	Bos taurus(ox) Bovis aries(sheep)	Bovidae	Glycin, aspartic acid,tyrosin,leucine,cystein	Manufacture of hard & soft capsule shell
Honey	Apis mellifera	Apidae	Invert sugar, fructose,dextrin, sucrose	Regulate heartbeat, suppress cough

Tab: 1

Molecular Docking

12. Introduction

Molecular docking is a computational technique used to determine the spatial arrangement of molecules when they interact, especially focusing on how small compounds or drugs bind to their targets. The goal of these studies is to predict the most probable three-dimensional conformations of these molecular complexes. Docking algorithms generate various possible configurations, which are then evaluated using scoring functions to identify the most biologically relevant structures. This review highlights current advancements in the computational tools involved in docking-based virtual screening of small molecule libraries. It explores different docking methodologies, search strategies, and scoring mechanisms, emphasizing their significance in targeting proteins and nucleic acids for therapeutic purposes. The discussion also addresses the limitations inherent in current technologies and potential avenues for future research [15]

13. Definition Of Molecular Docking

Molecular docking is a technique used to forecast hoe protein, such as an enzyme, interacts with small molecules known as ligands. This interaction can influence the protein's function by either enhancing or suppressing its activity, depending on how the ligand binds within the protein's active site. The process provides insights into the behaviour of these small molecules within the protein's binding pockets, which is crucial for understanding their biological effects [16].

In the field of drug discovery, molecular docking is employed to evaluate and predict the potential binding affinity of various compounds to specific targets. Tools like PyRx facilitate this by virtually screening multiple ligands to determine which molecules are most likely to bind effectively to the protein of interest.

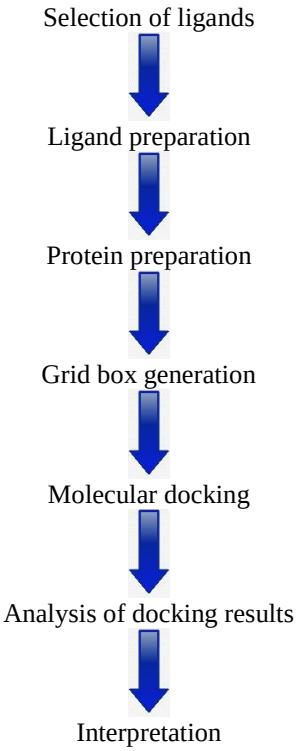
14. Types

- **Flexible Ligand Docking**: This is the most commonly employed method, where the target protein remains rigid while the ligand can adapt its conformation during binding.
- **Rigid-Body Docking**: Both the protein and ligand are treated as inflexible entities, with only their positions being adjusted during the docking process.
- **Flexible Docking**: In this approach, both the target protein and the ligand are permitted to change their shapes, accounting for conformational flexibility, especially around torsion angles and rotatable bonds. While offering greater accuracy, it demands significant computational resources [17]

15. Materials & Method

RECEPTORS	LIGAND
Ox2(4S0V)	Kamepferol
MT1(6ME4)	Quercetin
MT2(6ME9)	Seratonin

16. Steps For Molecular Docking



17. Result

Name of the ligand	Protein ID	Protein Name	Binding Affinity	rmsd/ub	rmsd/lb
Kamepferol	4S0V	Ox2	-8.5	0	0
Quercetin		Ox2	-8.4	0	0
Seratonin		Ox2	-6	0	0
Kamepferol	6ME4	MT1	-7.4	0	0
Quercetin		MT1	-6.9	0	0
Seratonin		MT1	-6.3	0	0
Kamepferol	6ME9	MT2	-8.4	0	0
Quercetin		MT2	-9.1	0	0
Seratonin		MT2	-6.7	0	0

Tab: 3

18. MT2- Quercetin

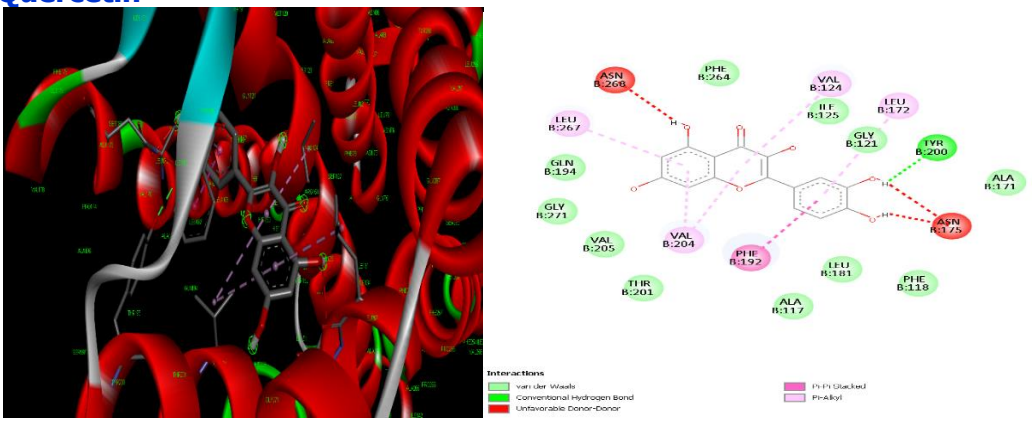


Fig: 3

Among the tested ligand–receptor combinations, Quercetin showed the best binding affinity with the MT2 receptor, with a binding affinity of −9.1 kcal/mol. This was the lowest binding energy observed in the docking study, indicating a comparatively stronger predicted ligand–receptor interaction.

19. Materials& Methods

S.no	Materials	Uses
1.	Albizia bark	API
2.	Kiwi	API
3.	Honey	Sweetener, Preservative
4.	Gelatin Powder	Gelling Agent, Emulsifier

Tab:4

20. Methods

Extraction Of Albizia Bark:

- Fresh stem bark of A. lebbeck was collected
- The bark was washed thoroughly with deionised water, shade dried, & then pulverized into coarse powder using a mortar & pestle
- The extraction was performed using water as a solvent
- 10g of the coarse powder was soaked in 100ml of deionised in a conical flask
- The mixture was heated in a water bath with constant shaking at 45^{o}C
- Extract was filtered through using whatmann No 1 filter paper. If necessary, the extract was stored at 4^{o}C
- The filtrate was transferred to a china dish and concentrated in a water bath at 25-30^{o}C to obtain the powdered active extract

Extraction from Kiwi Fruit:

- Selection of kiwi fruit
- Washing & rubbing the outer surface of the fruit to scrape away the dirt & scratchy hair
- Cut the unpeeled fruit into slices
- Addition of water & boiled for about 20-30 mins
- Straining the extract with muslin cloth

Preparation of Gummies:

Gelatin powder was dissolved in cold kiwi fruit extract to prepare the gel base

The mixture was heated heated to 70^{o}C

Powdered herbal extract of Albizia bark was added to the gel base

Honey was added to the gel base as a sweetener and preservative

The resultant mixture was stirred until ahomogenous mixture was obtained and then poured into molds while still hot

The molds were allowed to set at room temperature for 30 mins

The molds were transferred to the refrigerator

After 3-4 hrs, the gummies were removed from the molds and collected[18]

Chemical Test

S.no	Test	Experiment	Observation
1.	**ALKALOIDS:** Picric acid test:	Few ml filtrate + 3-4 drops of 2% picric acid solution	An orange color
2.	**CARBOHYDRATE:** Test for pentoses:	2ml conc. HCl + little amount of phloroglucinol+ equal amount of aqueous extract solution + heated over flame	A red Color
3.	**REDUCING SUGAR:** Fehling test:	1ml each of fehling's solution A&B +1ml filtrate +boiled in water bath	A red precipitate
4.	**GLYCOSIDES**: Bromine water test:	Plant extract + few ml of bromine water	A yellow precipitate
5.	**PROTEIN AND AMINO ACIDS:** Millon's test:	2ml filtrate + few drops of millon's reagent	A white precipitate
6.	**FLAVANOIDS:** Lead acetate test:	1ml plant extract + few drops of 10% lead acetate solution	A yellow precipitate
7.	**PHENOLIC COMPOUND:** Iodine test:	1ml extract + few drops of dil. Iodine solution	A transient red color
8.	**TANNINS:** Gelatin test:	Plant extract is dissolved in 5 ml distilled water + 1% gelatin solution + 10% NaCl	A white precipitate
9.	**SAPONIN:** Foam test:	0.5 gm aq. Extract + 2ml water (vigorously shaken)	Persistent foam for 10 mins
10.	**TERPINOIDS:**	2ml chloroform + 5ml plant extract, (evaporated on water bath) + 3ml conc.H2SO4 (boiled on water bath)	A grey colored solution
11.	**QUINONES:** Conc. HCl test:	Plant extract + Conc. HCl	A green color
12.	**ANTHOCYANIN**: HCl test:	2ml Plant extract + 2ml 2N HCl (+ few ml ammonia)	Pink-red sol. Which turns blue-violet after addition of ammonia
13.	**COUMARINS:** NaOH test:	Plant extract + 10% NaOH + Chloroform	A yellow color
14.	**FIXED OILS AND FAT:** Stain test:	Little quantity of plant extract is pressed in between to filter papers	oil stain on the paper[19]

21. Evaluation test

PH Measurement:

We weight 1 Gummies and mix in 10 ml beaker with diluent water. Then calibrated with pH meter with standard alkali solution, 7pH alkali solution [20].

Thickness test:

The Gummies seem to be relatively thin, approximately 5-8 mm in thickness. Vernier calliper is used for measure thickness of Gummies [21].

Weight Variation Test:

The Weight variation test ensure uniformity in the dosage form. For 2g Gummies individual Gummies had been weighed and the average weight was calculated. The deviation of each Gummy from the average was checked. Acceptance Criteria: According to pharmacopeial standards, the individual weight should not deviate by more than +(or)- 5%

Average Weight: 2.0g Acceptable Range;1.9-2.1g [22]

Stability Study:

The Study evaluates the physical, chemical, and microbiological stability of the Gummies under various storage conditions over time. Polyherbal gummies have been typically stored at room temperature (25±2ºC), accelerated conditions (40±2ºC with 75±5%Rh), or refrigerated (5±3ºCwith low humidity) for up to three months.

DPPH Scavenging Activity:

The gummy sample (1 g) was weighed and crushed/cut into small pieces, followed by extraction with methanol (10 mL) and vortexing for 15-30 min. The mixture was then centrifuged/filtered, and the supernatant was collected as the "gummy extract." Different concentrations of the extract (0.3 mL) were mixed with DPPH solution (2.7 mL, 0.1 mM in methanol), shaken well, and incubated for 45 min at room temperature in a dark place. The absorbance was measured at 517 nm against the blank, and the scavenging activity was calculated using Eq. (1). The IC50 value was used to evaluate the antioxidant activity.

$$\text{Free radical scavenging activity (\%)} = [(Ac - As) / Ac] \times 100 \cdots (1)$$

Where
AC - Absorbance of control
AS - Absorbance of sample [23]

22. Report

Organoleptic Evaluation:

Parameter	Observation
Colour	brown
odour	earthy
shape	Consistent with mold shape
taste	tangy
consistency	firm
texture	Chewy, soft, elastic

Tab: 5

Physical Evaluation:

1. Ph

The pH of the prepared gummies was determined using a suitable pH meter. The observed pH value was approximately 5.4. The formulated gummies showed a slightly acidic pH, which is considered suitable for consumption of gummies.

2. Thickness:

FORMULATION	THICKNESS (mm)
F1	5.20
F2	5.35
F3	5.23

Tab: 6

Average thickness = 5.26

The thickness values of F1, F2& F3 were found to be relatively close to each other, indicating good uniformity in the size of the prepared gummies.

3. Stability

The formulated herbal gummies were found to be physically stable during the four-week observation period. No significant changes were observed in appearance, colour, and texture of the gummies.

4. Weight Variation:

10 gummies were randomly selected and weighed individually using an analytical balance.

INDIVIDUAL DEVIATION= INDIVIDUAL WT-AVERAGE WT

$$\text{PERCENTAGE DEVIATION} = \frac{INDIVIDUAL\ DEVIATION}{AVERAGE\ WEIGHT} \times 100$$

S.NO	INDIVIDUAL WEIGHT	AVERAGE WEIGHT	INDIVIDUAL DEVIATION	PERCENTAGE DEVIATION	RESULT
1.	4.43	4.765	-0.335	-7.03%	All the gummies were passes the test
2.	4.45		-0.315	-6.61%	
3.	4.47		-0.295	-6.19%	
4.	4.65		-0.115	-2.41%	
5.	4.58		-0.185	-3.88%	
6.	4.41		-0.355	-7.45%	
7.	5.12		+0.355	+7.45%	
8.	4.96		+0.195	+4.09%	
9.	5.07		+0.305	+6.40%	
10.	4.52		-0.245	-5.14%	

(All the gummies were falls within ± 7.5% limit as per pharmacopeial standard)

Tab:7

5. DPPH Scavenging Activity:

DPPH Scavenging Activity (%) = $\{(ac - as)|ac\}\times 100$

S.no	Conc. (µg/ml)	Absorbance at 517nm	DPPH Scavenging Activity (%)
1.	50	0.650	27.78
2.	100	0.560	37.78
3.	150	0.465	48.33
4.	200	0.375	58.33
5.	250	0.295	67.22

Tab: 8

The formulated Albizia- kiwi Herbal gummy showed a concentration-dependent increase in DPPH radical Scavenging Activity. The antioxidant Activity Increased from 27.78%at 50µg/ml to67.22% at 250µg/ml. the formulation showed approximately 50% radical scavenging activity appreciable in-vitro antioxidant potential of the formulated herbal gummy.

23. Phytochemical Screening Test For Albizia Lebbeck Bark

S.NO	PHYTOCHEMICAL SCREENING TEST	RESULT
1.	Alkaloids	+
2.	Carbohydrates	+
3.	Reducing sugar	+
4.	Glycosides	-
5.	Protein and amino acids	-
6.	Flavonoids	+
7.	Tannins	+
8.	Saponins	+
9.	Quinones	-
10.	Anthocyanins	-
11.	Coumarins	-
12.	Fixed oils & Fats	-

Tab: 9

24. Phytochemical Screening Test For Kiwi

S.NO	PHYTOCHEMICAL SCREENING TEST	RESULT
1.	Alkaloids	+
2.	Reducing Sugar	+
3.	Glycosides	+
4.	Flavonoids	-
5.	Phenolic Compounds	+
6.	Saponins	+
7.	Terpenoids	+
8.	Proteins And Amino Acids	-
9.	Starch	-
10.	Carbohydrates	+

11.	Quinones	+
12.	Coumarins	-

Tab: 10

25. Discussion

The formulated Albizia lebbeck–Kiwi herbal gummies were evaluated for various organoleptic, physical, and biochemical parameters. The gummies exhibited a brown colour, earthy odour, tangy taste, and a firm, chewy texture consistent with the standard characteristics expected of a gummy formulation. The pH of the formulation was found to be approximately 5.4, indicating a mildly acidic nature, which is considered acceptable and safe for oral consumption.

Thickness measurements across three formulations (F1, F2, F3) ranged narrowly between 3.20 mm and 3.35 mm, with an average of 3.26 mm, reflecting good uniformity and reproducibility in the moulding process. Weight variation studies conducted on ten randomly selected gummies showed percentage deviations within ±7.5%, which falls within the acceptable pharmacopeial limit, confirming batch-to-batch consistency of the formulation. Furthermore, the gummies remained physically stable over a four-week observation period, with no notable changes in appearance, colour, or texture, suggesting adequate shelf stability under the tested conditions.

The in-vitro antioxidant potential of the formulation was assessed using the DPPH radical scavenging assay. The results demonstrated a clear concentration-dependent increase in scavenging activity, rising from 27.78% at 50 µg/mL to 67.22% at 250 µg/mL, with the formulation showing approximately 50% inhibition at intermediate concentrations. This confirms an appreciable antioxidant capacity, which is significant given the established link between oxidative stress and sleep disturbances — antioxidant activity may therefore contribute synergistically to the sedative-hypnotic effect of the formulation.

Phytochemical screening of the individual extracts supported the presence of pharmacologically relevant constituents: Albizia lebbeck bark extract tested positive for alkaloids, carbohydrates, reducing sugars, flavonoids, tannins, and saponins, while Kiwi extract tested positive for alkaloids, reducing sugars, glycosides, phenolic compounds, saponins, terpenoids, carbohydrates, and quinones. The presence of saponins and flavonoids in both extracts is particularly noteworthy, as these classes of compounds have been previously associated with GABAergic modulation and antioxidant activity, lending phytochemical support to the proposed sedative mechanism of action.

Overall, the results indicate that the Albizia lebbeck–Kiwi herbal gummy formulation is physically stable, pharmacopeially compliant, and possesses measurable in-vitro antioxidant activity, supporting its potential as a natural adjunct for the management of insomnia**.**

26. Conclusion

The herbal medicated gummies formulated from Albizia lebbeck bark extract (powder form) & kiwi fruit extract serve as a novel approach for the management of insomnia. The number of people suffering from insomnia is increasing day by day, so sleep should never be compromised. Experts agree that insomnia can potentially lead to further diseases like heart disease, diabetes, cognitive decline, immune system failure, etc. The prepared gummies were tested by conducting evaluation tests such as a thickness test, weight variation test, stability test & pH test. Our patient-friendly gummies have passed all those tests in addition to the DPPH radical scavenging assay, which is an in vitro test. Phytochemical screening of both Albizia lebbeck bark extract & kiwi fruit extracts further validated the presence of pharmacologically active constituents that support the sleep cycle & further contribute to GABAergic modulation & antioxidant-mediated neuroprotection. Thus, it can be concluded that the Albizia lebbeck-kiwi herbal gummy is pharmacopeially compliant, a patient-friendly dosage form that eases administration with promising antioxidant & potential sedative-hypnotic properties. However, further in vivo studies are recommended to validate the mechanism of action suggested through molecular docking and phytochemical analysis.

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