WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 10, 927-944. Research Article ISSN 2277–7105

FORMULATION AND EVALUATION OF MORINGA OLEIFERA NUTRITIVE AND IMMUNE BOOSTING JELLY

Piyush S. Mahajan*[1], Dr. S. D Barhate[2], Roshani R. Naik[3], Vaishali V. Naik[4] and Sakshi A. Nanote[5]

[1]Assistant Professor, [2]Principal, [3,4,5]Student, Shree Sureshdada Jain Institute of Pharmaceutical Education and Research, Jamner, Dist. Jalgaon- 424206.

Article Received on
25 March 2025,
Revised on 14 April 2025,
Accepted on 04 May 2025
DOI: 10.20959/wjpr202510-36611

***Corresponding Author**
Piyush S. Mahajan
Assistant Professor, Shree Sureshdada Jain Institute of Pharmaceutical Education and Research, Jamner, Dist. Jalgaon- 424206.

ABSTRACT

The present study examines the formulation and assessment of an herbal jelly incorporating Moringa oleifera as a principal functional ingredient, alongside Withania somnifera (Ashwagandha) and Cinnamomum zeylanicum (Cinnamon), to enhance nutritional value and immune-boosting potential. Moringa oleifera is recognized for its high content of antioxidants, vitamins, and bioactive phytochemicals, which support immune function and overall health. The jelly was formulated using a 10% gelatin base and was enriched with herbal powders and natural flavoring agents, including tamarind and vanilla. The organoleptic properties, consistency, texture, and stability of the jellies were evaluated. The objective was to develop a convenient, chewable dosage form that promotes better patient compliance, particularly among children and the elderly. The study concludes that MO-based jellies provide a palatable and effective means of delivering herbal immune-boosting agents, offering a novel approach to functional confectionery in herbal nutraceuticals.

KEYWORDS: Herbal formulation, *Moringa oleifera*, immune booster, jelly, Ashwagandha, Cinnamon, gelatin-based nutraceutical

INTRODUCTION

Nutrition

Nutrition is a scientific discipline focused on nutrients, growth, development, equilibrium, and bodily repair. It can be defined as the process through which animals or plants consume

and process essential food substances. These crucial nutrients include proteins, carbohydrates, fats, vitamins, minerals, and electrolytes.[1]

Immunity

The body's ability to resist the detrimental effects of pathogenic microbial infections is termed 'immunity', while the inability to resist such infections is known as 'susceptibility'. The study of immunity is called immunology, and the preparations used to induce immunity are called immunological preparations. While immunological mechanisms protect the body against infectious agents, they can also cause continuous damage. The immune system defends an individual against foreign invaders, particularly microbial agents and their toxic by-products. However, the activities of this system are not always beneficial to the body.[2] The immune system is intricate and is categorized into two types: i) innate or nonspecific immunity, which involves the activation and participation of preexisting mechanisms, including natural barriers (skin and mucosa) and secretions; and ii) adaptive or specific immunity, which targets previously recognized specific microorganisms or antigens. When a pathogen is unfamiliar to the host, it is initially detected by the innate immune system, followed by the activation of the adaptive immune response.[3]

Jellies- Oral administration is the most widely used and convenient route for various drugs to achieve enhanced pharmacotherapeutic benefits due to its low cost and ease of administration, leading to improved patient compliance. Recent advancements in novel drug delivery systems (NDDS) aim to enhance the safety and efficacy of dosage forms for administration and to improve patient compliance and convenience, thus leading to the development of oral medicated jellies.[4-5] This formulation helps improve bioavailability, bypass extensive hepatic first-pass metabolism, reduce dosage wastage and dose dumping, and enhance stability and taste masking. Currently, jelly candies are readily accepted by children with complete dentition as they enjoy the taste and chewing properties of the jellies, which are often flavoured with fruit juices and extracts and possess sweetness.[6-7]

Types Of Jellies

Jellies can be distributed into three types

- **Medicated jelly**

Primarily used on mucous membranes and skin for antibacterial, spermicidal, and original anesthetic purposes. These jellies contain sufficient water content. They give a cooling sensation as the water evaporates, leaving a defensive coating before.

- **lubricating jelly**

Used to lubricate medical bias similar as surgical gloves, cytoscopes, cutlet booths, catheters, and rectal thermometers.

- **Miscellaneous jellies**

are thin, transparent, and water-answerable. As these jellies are used to slick particulars fitted into sterile body areas like the urinary bladder, they must be sterile.[8]

1. Patch testing- These jellies serve as carriers for allergens applied in perceptivity tests. As the patches dry, a residual film forms, helping maintain distinction and help result confusion.
2. Electrocardiography Jelly is applied to electrodes to reduce electrical resistance between the case's skin and the electrode. The jelly contains Sodium Chloride, Pumice Powder, and Glycerine. Sodium Chloride conducts electricity effectively, while Glycerine acts as a humectant.[9]

- **Advantages**

1. Can be administered anywhere and anytime without water.
2. Allows for design inflexibility.
3. Enhances bioavailability or addresses first- pass metabolism.
4. Excellent for acute drug.
5. Simple to manufacture and bring-effective.[10]

- **Disadvantages**

1. Inadequately formulated jellies may have an unpleasant taste.
2. High threat of microbial impurity.
3. Oral jellies are hygroscopic, taking storehouse in dry conditions.[11]

➢ **Drug Profile Of Herbal Plants**

1) Moringa Oleifera Lam

A. **Synonyms**- Drumstick tree, Horseradish tree, or Saguna

B. **Family**- Belongs to the *Moringaceae*

C. **Biological source**- Originates from the dried, elongated, slender, triangular seed-pods of Moringa oleifera

D. **Chemical Constituent**- such as flavonoids (apigenin, quercetin, luteolin, myricetin, kaempferol), lignans (secoisolariciresinol, isolariciresinol, medioresinol, epipinoresinol glycosides), and phenolcarboxylic acids and their derivatives (coumaroylquinic, caffeoylquinic, feruloylquinic acids) predominantly found in moringa leaves.

E. **Uses**

a) Moringa is renowned for its significant ability to enhance immunity.

b) Its high antioxidant content further strengthens the immune system, offering protection against infections.

c) Additionally, moringa is abundant in iron and vitamin A, both of which are crucial for optimal immune system performance.

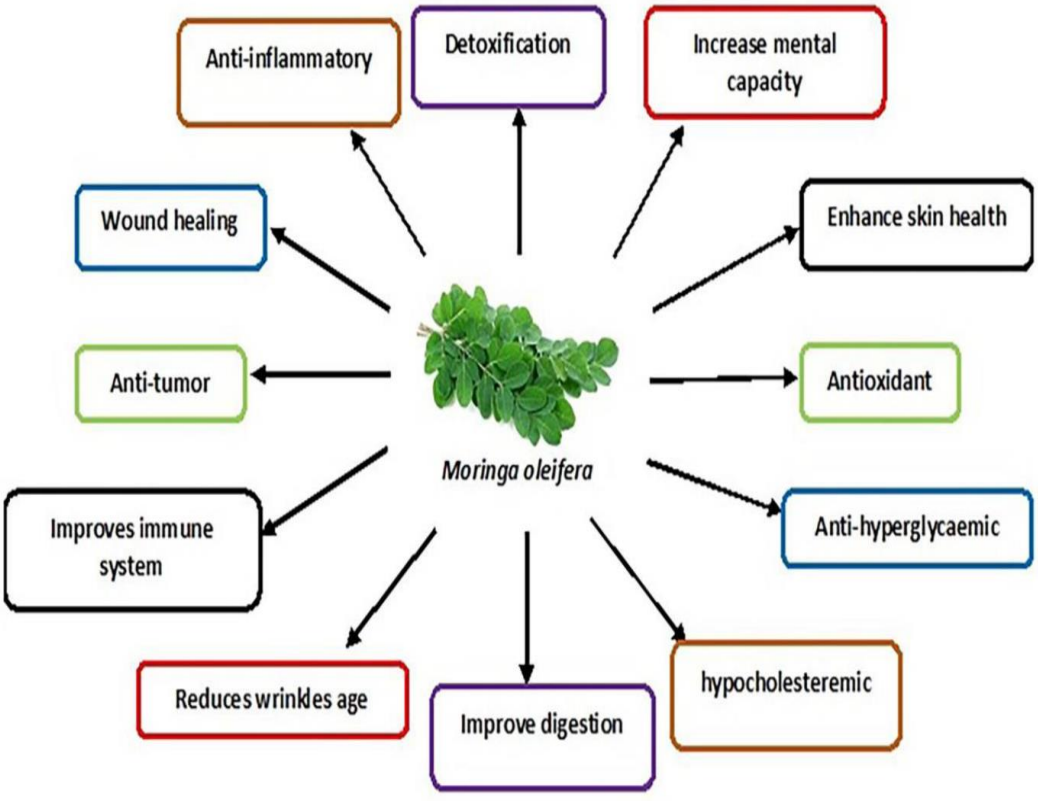


Fig No 1: Uses of Moringa Oleifera.

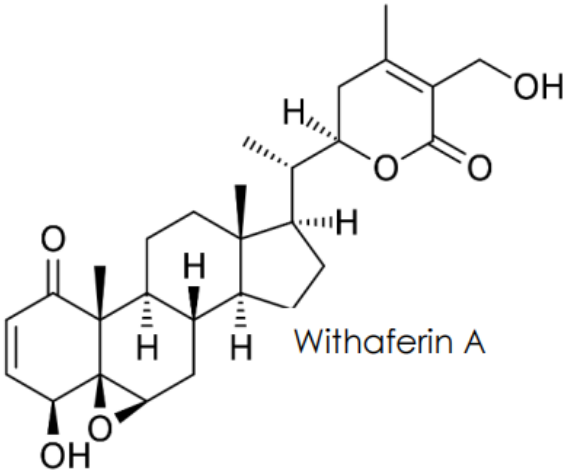
2. Ashwagandha

A. Synonym- Ashwagandha (*Withania somnifera* fam. *Solanaceae*), it is often referred to as "Indian Winter cherry" or "Indian Ginseng".

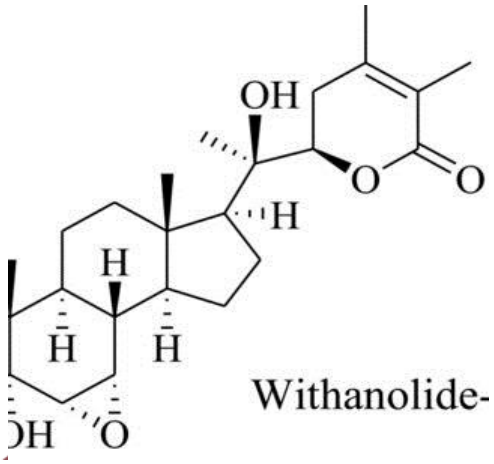
B. Family- *Solanaceae*

C. Biological Source- from the root of the Withania somnifera plant

D. Chemical Constituents- In active chemical constituents in Withania somnifera (WS) include alkaloids (isopelletierine, anaferine, cuseohygrine, anahygrine, etc.), steroidal lactones (withanolides, withaferins), and Sitoindosides and acylsterylglucosides, which act as anti-stress agents in Ashwagandha.



Withaferin A



Withanolide-

E. Uses

a) Ashwagandha is also known for its remarkable effects in boosting the immune system.

b) It has been found to promote anti-inflammatory and disease-fighting immune cells that help prevent illness.

c) Ashwagandha possesses strong anti-inflammatory properties.

d) The herb is rich in iron, which also aids in increasing red blood cell count.[12]

2) CINNAMON

A. Synonym- Cinnamon barks; Kalmi-Dalchini, Ceylon cinnamon

B. Family- *Lauracae*

C. Biological Source- Cinnamon is derived from the dried inner bark of the shoots of coppiced trees of Cinnamomum zeylanicum Nees. It must contain at least 1.0 percent of volatile oil.

D. Chemical Constituents- The active component of the drug is the volatile oil, which is light yellow when freshly distilled and turns red over time. The bark produces 14-16 percent of extractive soluble in 90.0 percent alcohol. Cinnamon oil comprises 60-70 percent cinnamaldehyde, 5-10 percent eugenol, along with benzaldehyde, cuminaldehyde, and other terpenes such as phellandrene, pinene, cymene, and caryophyllene. The oil ranges in colour from yellow to red, with a specific gravity of 1.00 – 1.030, an optical rotation of 0 to 2, and a refractive index of 1.563-1.582o.

E. Uses

a) The bark serves as a carminative, stomachic, and mild astringent.

b) It is also employed as a flavouring agent, stimulant, aromatic, and antiseptic.

c) Cinnamon is utilized as a spice and condiment and in the production of candy, dentifrices, and perfumes.[13]

4) Tamarind

A. Synonym- *Fructus tamarind*; Imli (Hindi)

B. Family- *Leguminosae*

C. Biological Source- tamarind consists of dried ripe fruits of *Tamarindus indica Linn.*

D. Chemical Constituents- Tamarind pulp contains 10% of tartaric, citric, and malic acid and about 8% of potassium hydrogen tartrate. It also contains 30-40% of invert sugar and small amount of nicotinic acid. The addition of sugar to the manufactured pulp to act as preservative somewhat lowers the natural proportion of acids.

E. Uses

a. Tamarind is used as mild laxative, digestive, carminative and antiscorbutic.

b. It is a pleasant acid refrigerant.

c. The fruits are also useful in gastropathy, bilious vomiting, datura poisoning, stomatitis and haemorrhoids.[14]

5) GELATIN

A. **Synonyms** - Gelform, Puragel, Gelatinum

B. **Family** – Bovidae

C. **Biological Source** - Gelatin is a protein derivative produced by evaporating an aqueous extract derived from the bones, skins, and tendons of various domesticated animals. Notable sources include Ox, Bos taurus, and Sheep.

D. **Chemical Constituents** - Gelatin is composed of the protein glutin, which, upon hydrolysis, yields a blend of amino acids. The approximate amino acid composition includes glycine (25.5%), alanine (8.7%), valine (2.5%), leucine (3.2%), isoleucine (1.4%), cystine and cysteine (0.1%), methionine (1.0%), tyrosine (0.5%), aspartic acid (6.6%), glutamic acid (11.4%), arginine (8.1%), lysine (4.1%), and histidine (0.8%). Nutritionally, gelatin is considered an incomplete protein as it lacks tryptophan.

E. **Uses**

a) Gelatin is utilized in the production of pastilles, paste, suppositories, capsules, pill coatings, and gelatin sponges; it also serves as a suspending agent, tablet binder, and coating agent.

b) Additionally, gelatin functions as a stabilizer, thickener, and texturizer in food products.

6) VANILLA

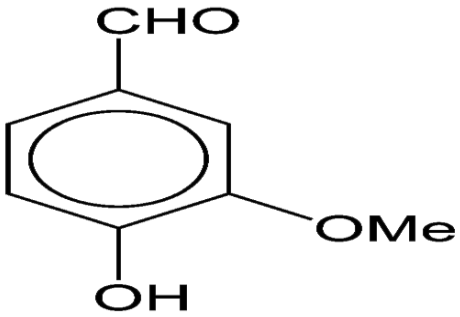
A. **Synonym**- Vanilla pod, Vanilla bean

B. **Family**- *Orchidaceae*

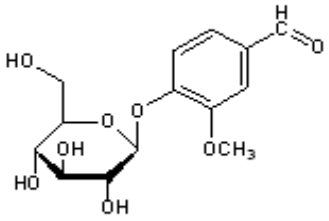
C. **Biological Source**- Vanilla (Vanilla Pods) is derived from the cured, fully developed but still unripe fruits of vanilla fragans (Salis.)

D. **Chemical Constituents**- Green vanilla is composed of glycosides, specifically glucovanillin (vanilloside) and glucovanillic alcohol. Upon hydrolysis, glucovanillic alcohol produces glucose and vanillic alcohol.

E. Uses- Vanilla Pods are extensively utilized in both confectionery and perfumery.[15]



Structure of Vanillin.



Structure of Glycovanillin.

7) SUCROSE SYRUP

A. Category - Pharmaceutical aid (sweetening agent; tablet excipient)

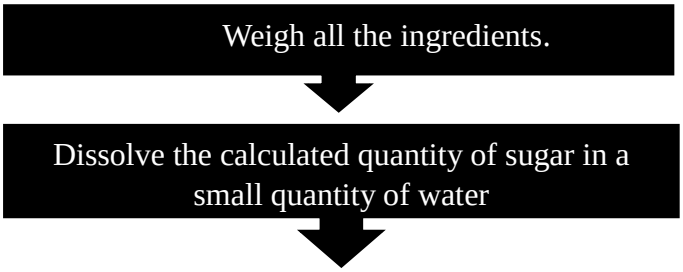
B. Description: An almost white or colourless crystal, dry crystalline powder; odorless; taste, sweet.

C. Concentration- 66.7%

D. Uses- This preparation is used as a pharmaceutical aid.

E. Storage- Store in a cool and dry place.[16]

F. Method of preparation of sucrose syrup



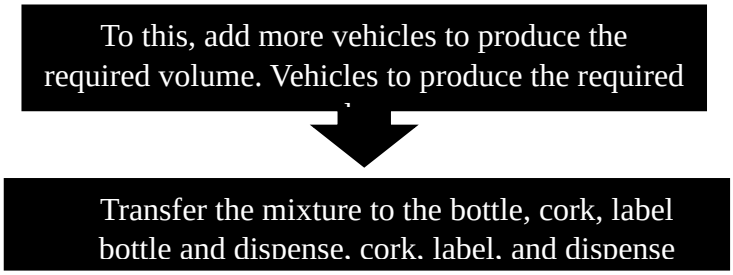


Fig No: 2: Showing the procedure of sucrose syrup.

8) BLACK CURRANT

Biological Source

Black currant (*Ribes nigrum*) is a deciduous shrub belonging to the *Grossulariaceae* family, native to Europe and parts of Asia. It produces dark purple to black berries that are well-known for their nutritional and medicinal benefits. In addition to the berries, the plant's leaves and seeds are also used for various purposes.

Chemical constituents

Anthocyanins: These pigments give black currants their dark color. The main types are cyanidin-3-glucoside and delphinidin-3-glucoside.

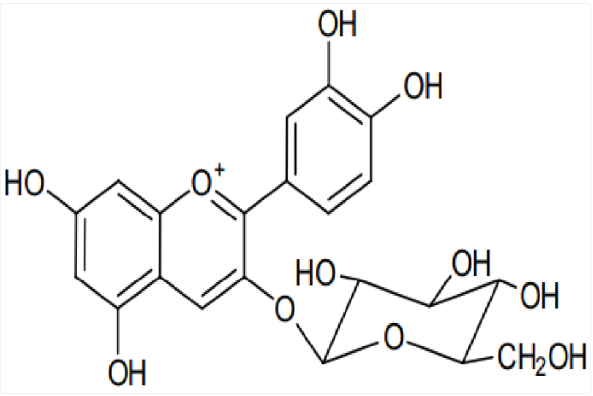
Vitamin C: Black currants have a high vitamin C content, offering more than 200% of the daily recommended amount in just 100 grams.

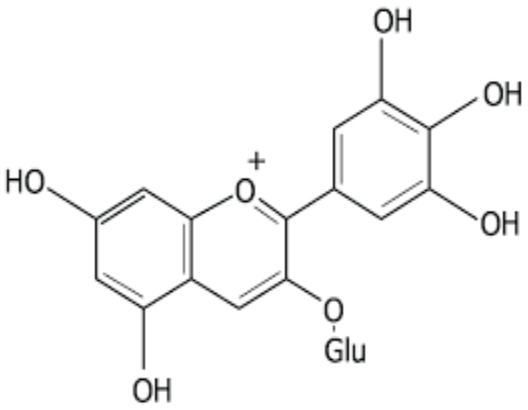
Gamma-Linolenic Acid (GLA): This omega-6 fatty acid, found in the seeds, has anti-inflammatory effects.

Flavonoids: Quercetin and kaempferol are flavonoids that act as antioxidants and help reduce inflammation.

Tannins: These compounds help with digestion because they have astringent properties.

Essential Oils: Found in the leaves, these oils have both antimicrobial and anti-inflammatory benefits.





Uses

a) Used in jams, jellies, syrups, and juices.

b) Supports immune function (due to high vitamin C).

c) Reducing inflammation (especially with seed oil for conditions like arthritis).

d) Provides antioxidants that protect against chronic diseases.[17]

- **List of Instruments and equipment**

Table No 3: List of Instruments and Equipment.

Sr. No	Instrument name	Model
1	Digital weighing balance	aczel
2	Digital pH Meter	Equiptronic Model no: EQ 614A
3	Brookfield viscometer	DV-E VISCOMETER
4	Desiccator	Glassware
5	Hot air oven	Spacelab
6	Hot plate	Spacelab
9	Powder mixier	MEGHDOOT
10	Sieve	No. 125

- **List of apparatuses**

Table No 4: List of Apparatus.

Sr. No	Apparatus	Image
1	Non-Stick Pan	
2	Beaker	
3	Petri dish	
4	Porcelain dish	
5	Measuring cylinder	
6	Spatula	
7	Stirrer	

- **List of Ingredients**

Table No 5: List of Ingredients.

Sr. No	Ingredients	Part used	Properties
1	Moringa Oleifera	Leaves powder	Analgesic, Lower cholesterol, Immune modulator

2	Ashwagandha	Root powder	Reduce blood sugar level, reduce stress
3	Cinnamon	Bark powder	Anti-bacterial, anti-oxidant, anti-inflammatory
4	Tamarind	Fruit pulp	Antioxidants, anti-inflammatory, vitamins and minerals, & Preservatives
5	Black currant	Fruit pulp	Antioxidants, vitamins and minerals & essential fatty acid
6	Vanilla	Fruit pod	Aromatic properties,
7	Sucrose syrup	Refined sugar	Sweet taste, Solubility & Preservative qualities
8	Gelatin	Animal collagen	Gel strength, Texture

➢ METHODOLOGY

- **Quantity of ingredients.**

Sr. No	Ingredients	F1	F2	F3
1	Moringa Oleifera	0.5 g	0.5 g	1 g
2	Ashwagandha	0.15 g	0.15 g	0.15 g
3	Cinnamon	0.2 g	0.2 g	0.2 g
4	Tamarind	2 g	6 g	20 g
5	Vanilla	1.2 ml	1.8 ml	2.5 ml
6	Black currant	1.5 g	4 g	6 g
7	Sucrose syrup	35 g	35 g	37 g
8	Gelatin	5 g	7 g	10 g
9	Distilled Water	Q. S	Q. S	Q. S

➢ Collection of Raw Material

1. **Collect the moringa leaves from the farm**
2. **Cut the leaves by hand**
3. **Clean all dust and dirt by washing it out with water**.
4. **Dry the cleaned leaves at room temperature for 2-3 days.**
5. **Grind the dried moringa leaves into a powder.**
6. **Sift the ground leaves using a sieve no. 125 to ensure a fine consistency**.

Fig. 5: Collection of Raw Material.

- **Method of preparation of medicated & nutritive jelly**

1. Weigh all the ingredients as follows:
2. Moringa (1 g), Cinnamon (0.2 g), Ashwagandha (0.15 g), Gelatin (10 g), Tamarind (25 g), Black Currant (6 g), Sugar (35 g), and Vanilla (2.5 ml).
3. First, pass the Moringa, Cinnamon, and Ashwagandha through a sieve with a mesh size of 125.
4. Soak the gelatin in warm water and allow it to bloom for 5 to 10 minutes.
5. In a pan, heat the sugar with a sufficient amount of distilled water to create a sucrose syrup at a temperature of 60 to 70 °C.
6. Once the syrup is ready, add the bloomed gelatin while stirring continuously.
7. Next, add the Tamarind, Black Currant, Moringa, Cinnamon, and Ashwagandha, mixing everything well with continued stirring.
8. Remove the pan from heat and mix in the vanilla essence.
9. Pour the mixture into silicone Molds and let it cool at room temperature.
10. Finally, refrigerate the Molds for 2 to 4 hours until set.

Fig. 6: Preparation and development of jellies.

- **Evaluation Parameter**

1. **Physical Parameters:** The prepared jellies were assessed for their physical properties, including clarity, precipitation, and consistency. The results showed that all the jellies

were transparent, brown in color, semi-solid in texture, consistent, and gave off an extremely pleasant fruity aroma.

2. **Stickiness and grittiness:** The formulations should be checked for stickiness and grittiness by gently rubbing a jelly sample between two fingers.
3. **pH:** At room temperature, the pH of the jellies was measured using a digital pH meter. To do this, 50 ml of distilled water was mixed with 0.5 g of jelly to create a 1% solution, and the pH was recorded. The stability and flavor of the finished jelly are influenced by its pH.
4. **Pourability of the Mixture:** The jelly mixture should be easy to pour into the molds. Key factors include gelatin that interferes with the gelatin molecules during the hot phase and raises pH levels to prevent pre-gelation. A longer setting time and lower temperature also help ensure the jelly pours and sets properly.[18]
5. **Viscosity:** The viscosity of the jelly was measured using a Brookfield viscometer with spindle number 61 for 2 minutes at 1.5 rpm**.**
6. **Texture Analysis:** A 12 mm hemispherical probe simulates pressing the gel surface with two fingers while a load cell measures the sample's response.[19]
7. **Syneresis**: This happens when a gel contracts during storage, leading to water separation, especially in gels with low gelling agent concentrations. All jellies were tested for syneresis at room temperature (25°C ± 5°C) and 8°C ± 1°C. Formulations showing syneresis were eliminated from further research. [18]
8. **Weight variation test:** First of all, 5 selected jellies. Weigh all 5 jellies collectively. Find out the average weight by applying this formula.

$$\text{Average weight} = \frac{\text{Wt. of 5 jellies}}{5}$$

$$\text{Average weight} = \frac{5.13+4.84+5.31+5.70+5.70}{5}$$

Then, weigh each of the 5 jellies one by one and note down their respective weights. We then found out the Percentage weight variation of each jelly using the formula.

$$\%\text{Weight Variation} = \frac{\text{Real Wt.- Avg. Wt.\% Weight Variation X 100}}{\text{Avg. Wt.}}$$

$$= \frac{570 - 5.336 \text{ X } 100}{5.336}$$

$$= 6.82\%.$$ [19-20]

9. Moisture content

1) Wt. of empty petri dish (W1) = 35.779 gm
2) Wt. of jelly = 5.24 gm
3) Wt. of petri dish + jelly (W2) = 41.01gm
4) Wt. of petri dish + Dried jelly (W3) = 39.10 gm

$$\text{Moisture Content} = \frac{\text{W2} - \text{W3}}{\text{W2} - \text{W1}} \text{ X } 100$$

$$= \frac{41.04 - 39.10}{41.01 - 35.77} \text{ X } 100$$

$$= \frac{1.91}{5.24} \text{ X } 100$$

$$= 0.3645 \text{ X } 100$$

$$= 36.45\%$$

➢ RESULT AND DISCUSSION

Table 7: Showing different evaluation parameters.

Sr. No	Evaluation parameter	Inference
1.	Appearance	Translucent
2.	Colour	Greenish brown
3.	Odor	Fruity aroma
4.	Texture	Smooth
5.	Consistency	Semisolid
6.	Stickiness	Non-sticky
7.	Grittiness	No-gritty
8.	pH	6.8
9.	Syneresis	No syneresis in jellies after 24 hrs
10.	Viscosity	3999 cp 1.5 rpm using spindle no. 61
11.	Texture analysis	Smooth and Soft consistency

12.	Moisture content	36.45%
13.	Weight variation	6.82%

➢ CONCLUSION

In conclusion, maintaining a healthy immune system is vital for overall health as it helps protect against illness. Adopting a healthy lifestyle can boost immunity. While allopathic medications can combat oxidative stress, their side effects and high costs make alternative options worth considering. The formulation of a nutritive and immune-boosting jelly using Moringa oleifera, ashwagandha, cinnamon, tamarind, vanilla, black currant, gelatin, and Sucrose syrup demonstrates a promising functional food product with both health-enhancing and sensory appeal. Each ingredient contributes unique bioactive compounds- such as antioxidants, polyphenols, vitamins, and adaptogens- that collectively support immune function, combat oxidative stress, and improve overall vitality. The use of gelatin provides a suitable texture and also offers added protein benefits. Overall, this jelly serves as a convenient and palatable way to incorporate powerful natural health boosters into the daily diet.

• REFERENCE

1. Sourabh Kosey, Sanjay Nagdev, Social and preventive pharmacy, page No-2.2.
2. Prof. Chandrakant Kokare, Nirali Prakashan, A textbook of pharmaceutical biotechnology, page No 8.1.
3. Chaplin DD. The Immune System: Overview of the Immune Response. Allergy clin Immunol., 2003; 111: 5442-59. [https://pubmed.ncbi.nlm.nih.gov/12592292/]
4. Dubey M. Sheth Z, Design and Development of Oral Medicated Jelly of Palonosetron HCL. Periapex- Indian Journal of Research, 2015; 4(6): 253-255.
5. Jadhav SB, Barkad VB, Shinde MK, Kadam VS and Katkam P. Development and
6. Evaluation of oral medicated jelly of Ondansetron HCL, World journal of Pharmacy and Pharmaceutical Science, 2017; 6(9): 1537-1549.
7. Beeram V. Formulation, Development & evaluation of cefixime oral medicated jelly, Indian Journal of Pharmaceutical Science, 2010; 78(2): 68-73.
8. Imai K. Alendronate sodium Hydrate (Oral Jelly) for the treatment of Osteoporosis: Review of a Novel, Easy to Swallow formulation. Clin Interv Aging, 2013; 8: 681-8.
9. Cooper and Gun, Dispensing for Pharmaceutics CBS Publishers & Distributors, Daraya Ganj New Delhi, Twelfth Edition, 2000: 214-216.
10. Mehta RM. Pharmaceutics- Ii Vallabh Prakashan Second Edition, 2003: 168-172.

11. H. Ye, H... J. Zhang, A. Xu, R.L. Hoo Resist in production from Adipose tissue is decreased in db./db. Obese mice and is reversed by rosiglitazone PLOS One, 2013; 8: p. e65543.
12. Dr. C. K. Kokate, A. P. Purohit Nirali Prakashan of Pharmacognosy 50th Edition, Page No- 14.33 to 14.35.
13. Biren N. Shah, A.K. Seth textbook of Pharmacognosy and phytochemistry second edition, Page No- 411 to 412 & 288 to 290.
14. Sanjay Setia A textbook of Pharmacognosy Pee Vee Publication, Page No- 303 to 304.
15. Indian Pharmacopoeia, 2010; Page No- 2166 to 2167.
16. Alvarez-Suarez, J. M., et al. (2014). "Black Currant Extracts: Phytochemicals and Health Benefits." *Food Research International*, 62: 93-103. https://doi.org/10.1016/j.foodres.2014.03.018
17. Shirse P. Formulation and Evaluation of Oral Medicated Jelly Containing Cyclodextrin Inclusion Complexed Water Insoluble Drug – Glimepiride; IJPRD., 2011; 142-153.
18. Raja Manali M.: Oral Medicated Jelly: A Recent Advancement in Formulation. International Journal of Pharmaceutical Sciences, 2016; 7(2): 13-20.
19. Kapli, V., Khambata, R. S., Robertson, A., Caulfield, M. J., & Ahluwalia, A. (2015). Dietary nitrate provides sustained blood pressure lowering in hypertensive patients: a randomized, phase 2, double-blind, placebo-controlled study. Hypertension, 2015; 65(2): 320-327.
20. R. R. Grosswald, J.B. Anderson and C.S. Andrew, Method for the manufacture of pharmaceutical cellulose capsules. US patient, 1997; 5: 698-155.