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Research Paper

Formulation Development Evaluation of Brain Boosting Jelly Containing Shankhapushpi and Almond Extract

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ABSTRACT

The growing incidence of mental health concerns, cognitive decline due to aging, and stress-related impairments has intensified interest in safe, natural cognitive enhancers. This study explores the formulation and evaluation of a brain-boosting jelly that integrates the cognitive-supportive properties of Shankhpushpi (Convolvulus pluricaulis) with the nutritional value of almond (Prunus dulcis) extract. Traditionally recognized in Ayurveda as a "Medhya Rasayana," Shankhpushpi is valued for enhancing memory and reducing anxiety, largely due to its alkaloids and flavonoids. Almonds, rich in vitamin E and omega-3 fatty acids, contribute to neural health and function. The objective is to create a palatable jelly formulation that synergistically combines these two ingredients to promote cognitive wellness. The development process includes optimizing extract concentrations and selecting appropriate gelling agents to ensure ideal texture, stability, and taste. The final product were assessed through physicochemical analyses—such as pH, viscosity, and spreadability evaluations for taste and consumer acceptability and the results were found to be pH: -6.21, Viscosity: -3200±50, Acceptable Consistancy, non sticky texture, Pleasant odour and among all the three batches, Batch F1 was found to be the most acceptable and appropriate based on evaluation parameters.

INTRODUCTION

In recent years, the pursuit of cognitive enhancement has gained considerable attention due to rising mental health challenges, age-related cognitive decline, academic performance pressures, and work-related stress. Cognitive health, which encompasses memory, learning

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ability, attention span, and mental clarity, is critical for overall well-being. As modern medicine seeks safer and more sustainable approaches to support brain health, there is a growing shift toward natural, plant-based nootropic agents and functional foods that combine traditional knowledge with scientific validation. One such botanical, Shankhpushpi (*Convolvulus pluricaulis*), has been a cornerstone in Ayurvedic medicine for centuries. Classified as a "Medhya Rasayana," Shankhpushpi is traditionally known for its potent effects on memory, intellect, and stress reduction [1]. This perennial herb, native to India, is easily recognizable by its distinctive conch-shaped flowers and creeping growth pattern. Its therapeutic efficacy is attributed to a rich composition of bioactive constituents, including alkaloids (such as shankhapushpine), flavonoids, glycosides, and coumarins [2]. These compounds are believed to exert multiple neuroprotective actions, including enhancement of cholinergic neurotransmission, inhibition of oxidative stress, and support of synaptic plasticity [3]. Scientific studies have confirmed its anxiolytic, antioxidant, and nootropic properties, validating its traditional use in mental health and cognitive disorders. In parallel, Prunus dulcis (commonly known as almond) is widely acknowledged in both traditional and modern nutritional sciences for its brain-supportive properties. Almonds are an excellent source of vitamin E, omega-3 and omega-6 fatty acids, magnesium, riboflavin, and polyphenolic compounds, which collectively contribute to maintaining neural membrane integrity, reducing neuroinflammation, and enhancing neurotransmitter function [4]. Clinical and animal studies have shown that regular almond consumption is associated with improved working memory, enhanced learning ability, and a reduced risk of neurodegenerative diseases such as Alzheimer's and Parkinson's [5]. Despite the well-documented cognitive benefits of both Shankhpushpi and almonds individually, their combined potential remains largely unexplored in the realm of functional foods or nutraceutical formulations. The complementary mechanisms—Shankhpushpi acting on neurotransmitter systems and almond nutrients supporting neuronal structure and function—create a compelling case for their co-formulation. Moreover, combining these agents may offer a multi-targeted approach to cognitive enhancement, supporting both the biochemical and structural aspects of brain health. Delivering these bioactives in a jelly format provides several advantages. In pharmaceutical and nutraceutical sciences, jellies are semi-solid, gel-based oral formulations that are palatable, easily administered, and particularly suited for pediatric and geriatric populations. They allow for enhanced bioavailability of active compounds due to faster dissolution and absorption compared to tablets or capsules. Additionally, jellies mask unpleasant tastes, improve compliance, and can be conveniently consumed without water, making them ideal for daily use [6]. This innovative approach aligns with the rising consumer demand for health-promoting functional food that are both effective and enjoyable. The conceptualization of a brain-boosting jelly stems from the convergence of ancient herbal wisdom and modern food technology. Historically, Shankhpushpi was administered in forms such as syrups, decoctions, and powders, while almonds have long been used in traditional medicine systems like Ayurveda and Unani in the form of paste, oil, and milk to nourish the nervous system [7]. Advances in herbal extraction, standardization, and formulation science now allow these traditional remedies to be transformed into modern, consumer-friendly formats with improved stability and bioactivity. This research aims to develop and evaluate a functional jelly formulation combining

standardized Shankhpushpi extract and almond paste or oil, targeting cognitive parameters such as memory retention, attention span, learning capacity, and mental alertness. The formulation process will include selection of appropriate excipients, standardization of active ingredients, organoleptic evaluation, and potential in-vitro or in-vivo testing to validate its efficacy and safety. The target population includes small children, working professionals under cognitive stress and older adults facing age-related cognitive decline. In conclusion, this study not only builds on the well-established therapeutic potential of Shankhpushpi and almonds but also introduces an innovative delivery system tailored to modern consumer needs. By creating a scientifically validated, natural, and user-friendly product, this work contributes meaningfully to the field of nootropics, integrative medicine, and functional nutrition—offering a novel approach to enhancing cognitive performance through the synergy of traditional botanicals and nutritional science.

Ideal Characteristics of Brain-Boosting Jelly

- Should have a pleasant taste and smooth mouthfeel to ensure acceptance in children.
- Must leave minimal or no residue in the mouth after administration.
- Should effectively mask any bitter or unpleasant flavors from herbal ingredients.
- Must be non-fragile, portable, and easy to handle in various daily settings.
- Should remain stable under varying environmental conditions without refrigeration.
- Must support high drug loading without compromising texture or taste.
- Should be easy to swallow, especially for children and the elderly.
- Must be compatible with standard processing and packaging equipment.
- Should maintain ingredient stability and avoid interactions that affect efficacy.
- Must be safe, appealing, and designed with pediatric-friendly features like color or flavor. [8]

Drug Selection Criteria for formulation

- **Therapeutic Efficacy:**

Both Shankhpushpi and Almonds are recognized for their neuroprotective and cognitive-enhancing properties. Shankhpushpi is utilized in Ayurvedic medicine to promote intelligence and memory, while Almonds are rich in omega-3 fatty acids, vitamin E, and antioxidants, which support brain function. [9]

- **Availability and Cost-effectiveness:**

Both ingredients are easily available in India; cost-effective and sustainable sources. Cultivated or wild-harvested under standard conditions.

- **Phytochemical Constituents:**

Shankhpushpi contains alkaloids (shankhpushpine), flavonoids, and glycosides. Almonds contain essential fatty acids, vitamin E, and phenolic compounds that help in improving memory and learning.

- **Safety and Toxicity Profile:**

Both are classified as safe in Ayurvedic and modern scientific literature when used in recommended doses. No significant side effects or toxicity reported.

- **Traditional and Scientific Validation:**

Long history of use in Ayurvedic medicine for memory and mental health. Supported by

experimental and clinical studies for their efficacy in cognitive disorders. [10]

- **Organoleptic Properties:**

Both have acceptable taste and smell, making them suitable for jelly formulation, especially for pediatric and geriatric populations.

- **Compatibility with Jelly Base:**

Both are compatible with jelly-forming agents like pectin and gelatin. Do not degrade or lose efficacy during jelly preparation. [11]

Types of Jellies

- **Oral Medicated Jellies:**

Formulated for local or systemic effects in the oral cavity or throat, these jellies are particularly suitable for children, elderly individuals, and patients with swallowing difficulties. They dissolve or disintegrate easily in the mouth, ensuring fast action and better patient adherence. [12]

- **Nutraceutical Jellies:**

These formulations contain nutritional or herbal ingredients—such as Shankhpushpi and almonds—that provide therapeutic benefits beyond basic nutrition, making them well-suited for enhancing cognitive function and overall wellness.

- **Sugar-Free or Low-Sugar Jellies:**

To cater to diabetic or health-conscious consumers, these jellies are prepared using non-sugar sweeteners. This expands their suitability for a wider audience, especially in the case of brain-health supplements.

- **Flavored or Fortified Jellies:**

These variants are enhanced with additional flavors, vitamins, or minerals to improve taste and boost nutritional value, aligning with the goal of supporting cognitive performance and appeal. [13]

Herbal Ingredients Used in Brain Boosting Jellies:

1. Shankhpushpi
2. Almond

1)Shankhpushpi:



Figure no 1: - Convolvulus Pluricaulis

Biological Source:

Botanical Name: *Convolvulus pluricaulis* (also referred to as *Convolvulus prostratus*)

Family: Convolvulaceae

Synonyms:

- **Sanskrit Names**: Shankhava, Shankhapushpi, Supushpi, Bhulaghna, Ksheerapushpi, Mangala Kusuma
- **Botanical Synonyms**: Sometimes identified as *Convolvulus microphyllus*;

Table no .1: - The Scientific Classification of *C. Pluricaulis* [14]

Taxonomical Rank	Taxon
Kingdom	Plantae
Sub Kingdom	Tracheobionta
Division	Magnoliophyte
Class	Magnoliopsida
Order	Solanales
Family	Convolvulaceae
Genus	*Convolvulus*
Species	*Pluricaulis*
Common Name	Shankhpushpi

- **Vernacular Names**

Table no .1: - Vernacular Name [14]

Language	**Name**
English	Speedwheel
Hindi	Shankhpushpi, Aparajit
Sanskrit	Sankhapuspi
Marathi	Shankhabela
Tamil	Sanghupushpam, kakkurattai

Herbarium:

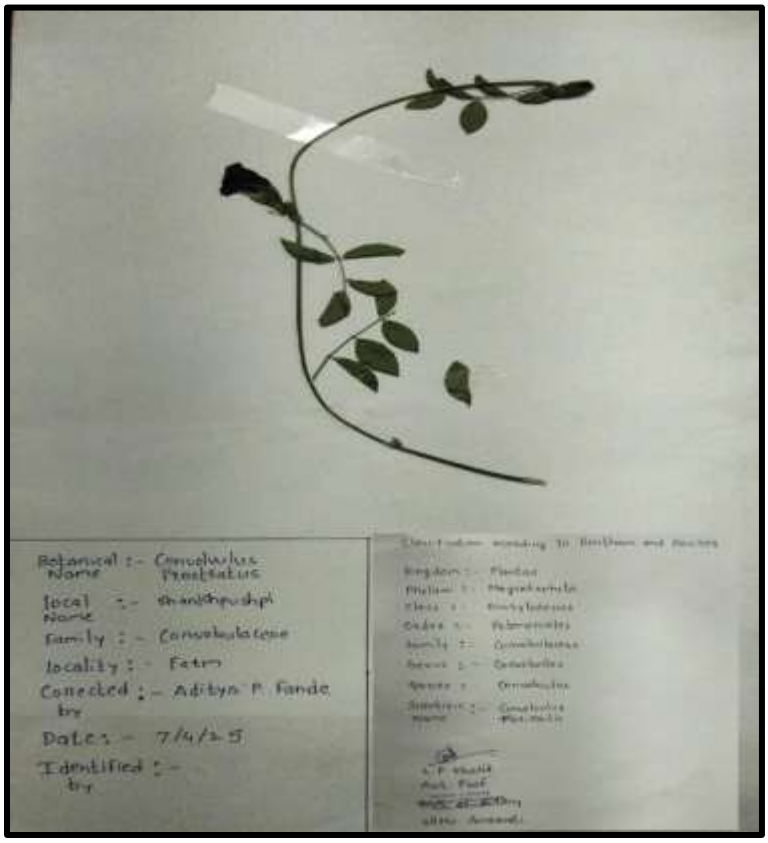


Figure no. 2. Herbarium of Shankhpushpi plant

Active Constituents and Therapeutic Properties

Convolvulus pluricaulis contains a variety of phytochemicals including alkaloids (such as shankhapushpine, convolvine, convolidine, convolamine), as well as flavonoids, steroids, carbohydrates, and proteins. These bioactives contribute to its cognitive-enhancing (nootropic), anxiety-reducing (anxiolytic), antioxidant, neuroprotective, and lipid-lowering effects. [15] [16].

Natural Habitat

This herb is a creeping perennial plant that typically thrives in the dry, sandy soils of India and parts of Myanmar (Burma), often found in open plains.

Traditional Applications

Widely recognized in Ayurveda, Shankhpushpi is classified under “medhyarasayana” herbs, known for their capacity to rejuvenate the mind. It has been traditionally used to:

- Enhance memory and intelligence
- Improve concentration
- Alleviate mental fatigue, stress, anxiety, and sleep-related issues
- Aid cardiovascular health by helping regulate cholesterol and triglyceride levels.

Relevance to Brain-Boosting Jelly

Owing to its proven mental health benefits, Shankhpushpi is a prime candidate for inclusion in brain-boosting jelly formulations. Its calming and neuroprotective properties, when combined with other cognitive-enhancing agents like almonds, can help promote improved memory, attention span, and mental clarity.

2)Almond:



Figure no.3. Prunus Dulcis

Active ingredients & characteristics:

Packed with beneficial monounsaturated fats, vitamin e (a powerful antioxidant), and proteins, this food is a nutritional powerhouse. Fiber, magnesium, and b vitamins. These contribute to brain health by safeguarding neurons, enhancing cognitive function, and mitigating oxidative stress. [15]

Habitat:

Originating from the middle east and south asia, this plant thrives in temperate regions.

Uses:

- Almonds have been found to enhance cognitive abilities, memory retention, and focus. They
- Are commonly found in brain health supplements and foods because of their numerous benefits.
- Neuroprotective and antioxidant properties. [16]

Advantages: -

- Enables quick onset of action by bypassing the digestive system.
- Enhances bioavailability through absorption in the mouth and upper throat.
- Ideal for patients with swallowing difficulties, such as the elderly or disabled.
- Suitable for those with nausea or vomiting who cannot tolerate oral pills.
- Increases adherence due to pleasant taste and ease of use.
- Useful in emergency situations where fast relief is required.
- Convenient for people with busy lifestyles or those constantly on the move. [17]

Disadvantage: -

- Often lacks strong scientific backing for claimed benefits.
- Marketing may exaggerate cognitive enhancement effects.
- Can cause side effects like anxiety, insomnia, or palpitations.
- Long-term health effects are largely unknown.
- May interact negatively with prescription medications.
- Risk of psychological dependence with frequent use. [17]

AIM

Formulation, Development and Evaluation of Brain Boosting Jelly containing Shankhpushpi and Almond extract.

OBJECTIVES

- To promote faster information processing and better decision-making through combined nootropic action.
- To reduce stress, anxiety, and mental fatigue using Shankhpushpi's adaptogenic and calming properties.
- To support emotional balance and focus for improved productivity and concentration.
- To protect neurons from oxidative damage and age-related cognitive decline with Shankhpushpi and almonds.
- To improve brain cell regeneration and synaptic plasticity for long-term cognitive health.
- To potentially lower the risk of neurodegenerative diseases like dementia through consistent use. [18]
- To increase sustained attention and focus during academic, professional, or daily tasks.
- To combat cognitive fatigue and mental sluggishness during stress or overexertion.
- To develop a jelly that is easy to consume for children, the elderly, and those with swallowing difficulties.
- To ensure the product is flavorful and enjoyable, promoting consistent daily use.
- To provide a natural, safe, and side-effect-free alternative to synthetic cognitive supplements.
- To support heart health and cerebral blood flow, enhancing overall brain function.
- To improve immune and gut health through nutrient-dense formulation. [19]

Plan of Work

To achieve the objective of proposed research work will be planned as followed:

- **Literature Review**
- **Selection of raw materials**
- **Extraction of herbal drug**
- **Formulation of herbal jelly**
- **Evaluation of jelly**

a) Physical appearance
b) Stickiness and grittiness
c) Spreadability
d) Viscosity
e) pH

MATERIAL AND METHOD

- **Collection of Materials:**

Table no.3- Ingredients and their uses in jelly preparation

S.No.	Ingredient	Function
1	Butterfly pea flower extract	Active ingredient
2	Almond milk	Nutritional base
3	Agar	Gelling agent
4	Methyl paraben	Preservative
5	Citric acid	pH modifier
6	Sugar	Sweetener
7	Distilled water	Solvent/base

Jellies are prepared by using fresh butterfly pea flower extract and fresh almond milk and was identified in Herbarium. Other ingredientsare collected from college like gelling agents (eg. Agar), preservative (eg.methyl paraben) and pH modifier (eg.citric acid).

- **Preparation of Herbal Jelly:**

1. Preparation of Butterfly Pea Flower Extract

Fresh butterfly pea flowers were carefully selected and rinsed to remove any surface impurities. Approximately 10 g of the flowers were steeped in 100 mL of freshly boiled hot water. This mixture was covered and allowed to stand for 1 hour to facilitate the extraction of the water-soluble phytoconstituents. The extract was then filtered using standard Whatman filter paper to obtain a clear, deep-blue infusion, which was later used as a key herbal component in the formulation.



Figure no.4. Butterfly Pea Flower Extract

2. Preparation of Almond Milk

Raw almonds were soaked in water overnight to soften the seed coat and enhance extractability. The next day, the outer skins were peeled, and the soaked almonds were blended with a measured volume of distilled water (1:3 ratio) until a fine emulsion was achieved. The resultant mixture was strained through a muslin cloth to obtain smooth, fresh almond milk, which served as a nutrient-rich base for the jelly formulation.

3. Formulation of Herbal Jelly

The filtered butterfly pea extract was transferred to a beaker and gently heated over a water bath to concentrate the extract slightly and ensure homogeneity. To this warm extract, the prepared almond milk was added slowly with continuous stirring to avoid phase separation. After uniform mixing, sucrose was incorporated as a sweetening agent, ensuring constant stirring to dissolve the sugar completely. Separately, agar powder (used as the gelling agent) was pre-soaked in a small volume of warm water to swell and activate the gel-forming ability. This prehydrated agar solution was then added gradually to the herbal mixture under continuous stirring to prevent clumping and ensure even distribution. Methyl paraben was added as a preservative to prolong shelf life and inhibit microbial growth, followed by the addition of citric acid to adjust the pH and enhance stability. For improved sensory appeal, a few drops of rose

oil were added as a natural flavoring agent. The final formulation was poured into clean molds and left undisturbed at room temperature for about 30 minutes to allow proper setting of the jelly matrix. [20]

Table.no.4. Formulation of jelly [25]

Sr. No.	Ingredients	F1	F2	F3
1	Shankhpushpi Extract	10ml	10ml	10ml
2	Almond Milk	10ml	10ml	10ml
3	Sucrose	8 gm	8 gm	8 gm
4	Agar	2.5 gm	3 gm	3.5 gm
5	Citric Acid	0.5 gm	0.4gm	0.5 gm
6	Methyl Paraben	0.1 gm	0.1 gm	0.1 gm
7	Flavouring Agent	0.2 ml	0.2 ml	0.2 ml

- **Evaluation of Jelly:**

The formulated herbal jelly was evaluated for parameter like pH, Physical appearance, Weight variation, viscosity, Sprediability.

a) Physical appearance: The physical appearance of jellies is evaluated based on color, clarity, texture, consistency, uniformity, and absence of defects. The jelly should have a uniform, appealing color without discoloration. The surface should be smooth, without cracks, bubbles, or shrinkage. Consistency is judged by the jelly's ability to retain shape or spread smoothly. All samples should appear uniform in size and shape. Finally, the jelly should be free from physical flaws such as air bubbles, foreign particles. Visual inspection is conducted under standard lighting as shown in Table no.5.

b) Stickiness and grittiness: Texture of the medicated jelly in terms of stickiness and grittiness had been evaluated by visual inspection of the product after mildly rubbing the jelly sample between two fingers as shown in Table no.5.

c) Spreadability: For the determination of spread ability sample of jelly was applied between two glass slide compressed to uniform thickness by placing 500gm weight. The time required to separate the two slide moves over the slide was taken measured of spared soared ability as shown in Table no.6.

S=m*L/T

Where,

m= weight tide to slide

L= length moved on glass slide

T= time taken

d) Viscosity: The Brookfield Viscosity Test measures the thickness or flow resistance of jellies using a Brookfield Viscometer. A spindle is immersed in the jelly sample and rotated at a set speed, with the instrument measuring the torque required to turn the spindle. This resistance reflects the jelly's viscosity, expressed in centipoise (cP). The test is conducted at a controlled temperature, as viscosity is temperature-sensitive. It helps determine consistency, stability, and batch uniformity of the product. Proper spindle selection and rotation speed are crucial for accurate results. This test ensures the jelly meets desired rheological properties for processing and consumer acceptance.as shown in Table no.5.

e) pH: The pH of all the jelly was determined using digital pH meter. 0.5gm of the weight formulation was dispersed in 50ml of distilled water and pH was noted as shown in Table no.5.

RESULT AND DISCUSSION

a) General appearance:



Figure. No. 5. Physical appearance

The jelly was **opaque** and not transparent. This lack of clarity is primarily due to the use of **almond milk**, which contains suspended particles such as proteins, fats, and plant fibers that scatter light and prevent transparency. Additionally, while **agar** can form clear gels when used with water or clear liquids, it will not produce a transparent result when combined with opaque liquids like almond milk

b) Physio-chemical properties of oral soft jelly:



Figure. No 6. pH Test

Table no.5 Physio-Chemical Evaluation

Sr no.	Test parameter	Formulation 1	Formulation 2	Formulation 3
1	Clarity	O	O	O
2	Consistancy	A	A	A
3	Texture	NS	NS	NS
4	Odour	P, R	P, R	P, R
5	pH	6.21	6.33	6.42
6	Viscosity	3200±50	3100±35	3600±55

(O: Opaque, A: Acceptable, NS: NonSticky, P: Pleasant, R: Rose Smell)

c) Spredability:



Figure.No.7. Spredability Test

Table no.6 Spreadability Test

Parameter	Sample A	Sample B	Sample C
Weight Applied (g)	500	500	500
Time (min)	1	1	1
Spread Diameter (cm)	4.9	5.0	5.1
Spreadability (g·cm/s)	40.8	41.7	42.5
Remarks	Smooth, acceptable spread	Optimal texture	Slightly softer

Challenges

- **Flavor Masking:**

Brain-boosting actives (like ginkgo biloba, omega-3s, or nootropics) often have bitter or metallic tastes that must be masked to improve compliance, especially in younger or sensitive users.

- **Moisture Sensitivity:**

Many jellies are hygroscopic and can degrade or become sticky if not properly sealed, affecting shelf life and user experience.

- **High Dose Volume:**

Brain supplements sometimes require higher doses (e.g., 300 mg of Bacopa or more), which may increase jelly size and affect palatability or ease of swallowing.

- **Solubility Problems:**

Water-soluble ingredients (like some amino acids or vitamins) can interact or crystallize, altering jelly texture and potentially reducing efficacy.

- **Consistency and Size Management:**

Creating a jelly that's compact yet contains an effective dose, with the right texture, is a common formulation hurdle.

- **Drug/Active Properties:**

Ingredient characteristics like poor solubility or unstable crystal forms can make uniform formulation and dosing difficult.

- **Environmental Sensitivity:**

Brain jellies must maintain quality across a range of climates, especially if sold globally. Heat or humidity can impact taste, texture, and stability. [21]

CONCLUSION

In end, this undertaking focused on developing a mind-boosting jelly using a aggregate of agar, Shankhpushpi flower extract, and almonds. The purpose was to create a product that would help cognitive fitness thru the usage of natural ingredients. Agar became selected as the gelling agent, whilst Shankhpushpi, recognised for its reminiscence-enhancing residences, and almonds, rich in nutrients useful for mind characteristic, were incorporated to beautify the overall effect of the jelly. The system technique concerned making ready 3 sample batches, each with various concentrations of Shankhpushpi extract and almonds. those versions were designed to decide the high-quality combination of ingredients for each taste and capacity cognitive advantages. After guidance, the samples were evaluated based totally on sensory characteristics along with taste, texture, and look. moreover, feedback became collected from contributors concerning the jelly's effect on intellectual clarity and consciousness. Out of the three batches, one pattern stood out as the most a hit. This batch, with a balanced component of Shankhpushpi extract and almonds, had an appropriate texture and flavor, while additionally yielding the fine effects in phrases of progressed consciousness and memory retention from the test participants. the alternative two batches, although suited in sensory characteristics, did not produce the equal substantive cognitive consequences.

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