

“Formulation And Development of Creatine Monohydrate Jelly”

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Abstract: Creatine monohydrate is a widely used nutritional supplement known for improving muscle strength, physical performance, and energy production in the body. It plays an important role in the regeneration of adenosine triphosphate (ATP), which is the primary source of energy during high-intensity physical activities. Creatine supplements are commonly available in conventional dosage forms such as powders, tablets, and capsules. However, these forms may sometimes have limitations including poor palatability and difficulty in swallowing, which can reduce patient compliance. The present project focuses on the formulation and development of creatine monohydrate in a jelly dosage form. Jelly is a semi-solid pharmaceutical preparation that is easy to consume, palatable, and suitable for individuals who experience difficulty in swallowing solid dosage forms. The jelly formulation can improve the acceptability and convenience of nutraceutical supplementation. In this study, creatine monohydrate jelly was prepared using suitable gelling agents along with sweeteners, flavoring agents, and preservatives to obtain a stable and palatable formulation. Different formulation parameters were considered during the preparation process to achieve the desired consistency and stability of the jelly.

Keywords: Creatine Monohydrate, Nutraceutical Jelly, Sports Nutrition, Muscle Performance, Energy Supplement, Patient compliance, Palatable Dosage Form, Easy Administration.

I. Background

Creatine monohydrate is one of the most widely used nutritional supplements, especially among athletes and fitness enthusiasts. Creatine is a naturally occurring compound found mainly in skeletal muscles and in small amounts in the brain. It is synthesized in the human body from amino acids such as glycine, arginine, and methionine. The primary function of creatine is to help in the production of adenosine triphosphate (ATP), which provides energy for muscle contraction during high-intensity physical activities. Creatine monohydrate is

the most stable and commonly used form of creatine in dietary supplements. It is widely used to improve muscle strength, enhance exercise performance, and increase lean muscle mass. Several studies have demonstrated that creatine supplementation can improve physical performance during short bursts of intense activity such as weightlifting, sprinting, and high-intensity training. Traditionally creatine monohydrate is available in powder, capsules, or tablet form. However, these conventional dosage forms may have limitations such as poor palatability, difficulty in swallowing, and delayed absorption. Therefore, there is a need to develop alternative dosage forms that are more convenient and acceptable to consumers.

1.2 Need for Jelly Formulation: The development of jelly formulations has gained increasing attention in the pharmaceutical and nutraceutical industries. Conventional dosage forms such as tablets and capsules may not be suitable for all individuals due to swallowing difficulties or unpleasant taste. Jelly formulations provide several advantages such as easy consumption, improved taste, better patient compliance, and faster disintegration in the mouth. They also provide flexibility in formulation and can improve the overall acceptability of the product. For nutraceutical supplements like creatine monohydrate, jelly dosage forms can make supplementation more convenient and attractive, particularly for athletes and fitness enthusiasts who require regular intake of the supplement.

1.3 Significance of Creatine Monohydrate :

Creatine monohydrate plays a significant role in enhancing physical performance and muscle strength. It is widely used as an ergogenic aid to improve athletic performance. Supplementation with creatine helps in increasing the phosphocreatine stores in muscles, which contributes to faster regeneration of ATP during high-intensity exercise. Creatine monohydrate has also been studied for potential benefits in improving muscle recovery, reducing fatigue, and supporting muscle growth. In addition to sports performance, creatine

supplementation has been investigated for potential therapeutic benefits in certain neuromuscular and neurological disorders. Due to its proven effectiveness, safety, and popularity among athletes, creatine monohydrate has become one of the most commonly consumed dietary supplements worldwide.

1.4 Scope of the Present Work: The present work focuses on the formulation and development of creatine monohydrate in jelly dosage form. The objective is to develop a palatable, stable, and

convenient dosage form that can improve patient compliance and ease of consumption. The study includes the selection of suitable gelling agents, sweeteners, preservatives, and flavoring agents to prepare a stable jelly formulation containing creatine monohydrate. Various evaluation parameters such as appearance, consistency, pH, spreadability, stability, and drug content may be studied to assess the quality of the formulation. The development of creatine monohydrate jelly may provide an innovative and user-friendly alternative to conventional dosage forms such as powders, capsules, and tablets.

II. LITERATURE REVIEW

Sr no	Author	Years	Title of study
1	Varanasi Satyanarayana Murthy et al.	2014	Evaluation of medicated oral jelly formulations
2	Jose Antonio et al.	2022	Pharmacokinetic evaluation of creatine monohydrate
3	Kyle b. pekar et al.	2021	Coamorphous formulation of creatine with citric acid
4	Patricia Y.saiki et al.	2025	Creatine degradation and stability study
5	Trehan et al.	2025	Enhanced absorption of creatine

III. MATERIALS AND METHODS

3.1 Materials :

- The materials used in the formulation of creatine monohydrate jelly were of analytical or pharmaceutical grade and were procured from reliable sources. The ingredients were selected based on their suitability for jelly formulation, stability, and safety for consumption.
- The following materials were used in the formulation:

Sr. No	Material	Category	Role in Formulation
1	Creatine Monohydrate	Active Ingredient	Provides energy support and muscle performance enhancement
2	Pectin / Gelatin	Gelling Agent	Provides jelly consistency and structure
3	Sucrose	Sweetening Agent	Improves taste and texture
4	Citric Acid	Acidifying Agent	Maintains pH and improves flavor
5	Sodium Benzoate	Preservative	Prevents microbial growth
6	Flavoring Agent	Flavor	Improves palatability
7	Colorant	Coloring Agent	Provides attractive appearance
8	Purified Water	Solvent	Base for jelly preparation

3.2 Equipment Used

- The following laboratory equipment were used during the formulation and evaluation of creatine monohydrate jelly:

Sr. No	Equipment	Purpose
1	Digital weighing balance	Accurate weighing of ingredients
2	Magnetic stirrer / Mechanical stirrer	Mixing and dissolving ingredients
3	Beakers and measuring cylinders	Preparation of formulation
4	Thermometer	Monitoring temperature
5	pH meter	Determination of pH
6	Water bath	Heating during preparation
7	Glass rods	Stirring and mixing
8	Molds or containers	Setting of jelly

3.3 Method of Preparation of Creatine Monohydrate Jelly

➤ Step 1: Preparation of Jelly Base

- The required quantity of purified water was taken in a beaker and heated to an appropriate temperature. The gelling agent such as pectin or gelatin was gradually added to the heated water with continuous stirring to ensure proper dissolution and prevent lump formation.

➤ Step 2: Addition of Sweetening Agent

- Sucrose was added to the mixture and stirred continuously until completely dissolved. The addition of sucrose improves the taste and contributes to the formation of the jelly texture.

➤ Step 3: Incorporation of Active Ingredient

- Creatine monohydrate was accurately weighed and added to the mixture. The solution was stirred continuously to ensure uniform dispersion of the active ingredient throughout the jelly base.

➤ Step 4: Addition of Acidifying Agent and Preservative

- Citric acid was added to adjust the pH and enhance the flavor of the formulation. Sodium benzoate was incorporated as a preservative to prevent microbial growth and improve the shelf life of the product.

➤ Step 5: Addition of Flavor and Color

- Suitable flavoring and coloring agents were added to improve the sensory characteristics and visual appearance of the jelly formulation.

➤ Step 6: Molding and Setting

- The prepared mixture was poured into molds or containers while still warm. The formulation was allowed to cool at room temperature until it formed a firm jelly structure.

3.4 Evaluation of Jelly Formulation

- The prepared jelly formulation was evaluated for various physicochemical parameters to determine its quality and stability.

➤ 1. Physical Appearance

- The jelly was observed visually for color, transparency, consistency, and presence of any particulate matter.

➤ 2. pH Determination

- The pH of the jelly formulation was measured using a digital pH meter to ensure compatibility with consumption and stability of the formulation.

➤ 3. Consistency and Texture

- The jelly was evaluated manually for smoothness, firmness, and spreadability.

➤ 4. Homogeneity

- The formulation was checked for uniform distribution of ingredients without any lumps or phase separation.

➤ 5. Stability Study

- The prepared jelly was stored under different temperature conditions to evaluate any changes in color, odor, consistency, or microbial growth over time

IV. Formulation Development of Creatine Monohydrate Jelly

4.1 Introduction : Formulation development is an important step in pharmaceutical and nutraceutical product design. It involves selecting suitable ingredients and optimizing their proportions to produce a stable, effective, and acceptable dosage form. In the present study, a jelly formulation containing creatine monohydrate was developed as a novel dosage form to improve palatability, ease of administration, and patient compliance. Creatine monohydrate is widely used as a nutritional supplement for improving muscle strength, energy production, and athletic performance. However, conventional dosage forms such as powders and capsules may not be convenient for all users. Therefore, the development of a jelly formulation offers an innovative approach for delivering creatine monohydrate in a more palatable and user-friendly form.

4.2 Selection of Ingredients: The ingredients used in the formulation were selected based on their functional role in the preparation of jelly. Each ingredient contributes to the stability, consistency, taste, and preservation of the formulation.

➤ Creatine Monohydrate

- Creatine monohydrate was used as the active ingredient in the formulation. It serves as a nutritional supplement that enhances muscle energy production and improves athletic performance.

➤ Gelling Agent

- Gelling agents such as gelatin, agar, or pectin were used to provide the semi-solid jelly structure. These agents help in forming the gel matrix that gives the product its characteristic consistency.

➤ Sweetening Agent

- Sweeteners such as sucrose were added to improve the taste and palatability of the jelly formulation.

● Preservatives

- Preservatives such as sodium benzoate were incorporated to prevent microbial growth and improve the shelf life of the formulation.

➤ Flavoring Agents

- Flavoring agents were added to mask the taste of creatine monohydrate and make the jelly more acceptable for consumption.

➤ Coloring Agents

- Food-grade coloring agents were used to enhance the visual appearance of the jelly.

➤ Purified Water

- Purified water was used as the solvent for dissolving and dispersing all ingredients in the formulation.

4.3 Composition of Creatine Monohydrate Jelly

- The composition of the developed creatine monohydrate jelly formulation is shown below.

Ingredient	Quantity	Role
Creatine Monohydrate	3 g	Active ingredient
Gelatin / Agar	2–3 g	Gelling agent
Sucrose	10–15 g	Sweetening agent
Sodium Benzoate	0.1 g	Preservative
Flavor	q.s	Flavoring agent
Food Color	q.s	Coloring agent
Purified Water	up to 100 ml	Solvent

4.1 Method of Preparation

1. The required quantity of purified water was taken in a clean beaker.
2. The gelling agent (gelatin or agar) was

soaked in water and allowed to hydrate properly.

3. The mixture was heated gently while stirring until the gelling agent dissolved completely.

4. Sucrose was added to the mixture and stirred until it dissolved completely.
5. Creatine monohydrate was then added slowly to the mixture with continuous stirring to ensure uniform distribution.
6. Sodium benzoate was added as a preservative.
7. Flavoring and coloring agents were added to improve the taste and appearance of the jelly.
8. The mixture was heated gently until a uniform solution was obtained.
9. The prepared solution was poured into molds or containers and allowed to cool.
10. On cooling, the solution solidified to form a jelly.

4.6 Packaging and Storage

- The prepared creatine monohydrate jelly was packed in airtight containers to prevent contamination and moisture loss. The product should be stored in a cool and dry place to maintain its stability and quality.
- Proper packaging helps in protecting the jelly from microbial contamination and environmental factors such as heat, light, and humidity.

V. Aim & Objectives :

Aim:

To Design A Tasty & Portable Creatine Monohydrate Jelly That Provide Easy Intake & Quick Energy Support .

Objective :

1. palatable jelly formulation of creatine monohydrate Development
2. Improve bioavailability and patient compliance
3. Select suitable gelling agents and excipients
4. Evaluate physical properties and chemical stability
5. Perform stability studies as per ICH guidelines

VI. Evaluation of Creatine Monohydrate Jelly

6.1 Physical Appearance

- The prepared creatine monohydrate jelly was

visually inspected to evaluate its physical characteristics such as color, transparency, texture, and homogeneity.

➤ Procedure:

- A small quantity of the jelly formulation was observed visually under normal lighting conditions. The appearance of the jelly was checked for smoothness, uniform color, absence of air bubbles, and absence of particulate matter.

➤ Observation:

- The prepared jelly appeared smooth, transparent, and uniformly colored with a pleasant texture.

6.2 Determination of pH

- The pH of the jelly formulation is an important parameter as it affects the stability of the product and its compatibility for oral consumption.

➤ Procedure:

1. A small quantity of jelly was dissolved in distilled water.
2. The pH of the solution was measured using a calibrated digital pH meter.

➤ Observation:

The pH of the creatine monohydrate jelly was found to be within the acceptable range for oral formulations.

6.3 Viscosity

- Viscosity determines the thickness and flow behavior of the jelly formulation. Proper viscosity ensures that the jelly maintains its semi-solid consistency

➤ Procedure:

The viscosity of the jelly formulation was measured using a viscometer at room temperature.

➤ Observation:

The jelly exhibited appropriate viscosity, indicating good gel formation and consistency.

6.4 Spreadability

- Spreadability is an important property that determines the ease with which the jelly spreads

- when applied or handled.
- **Procedure:**
1. A small quantity of jelly was placed between two glass slides.
 2. A specific weight was placed on the upper slide.
 3. The time taken for the slides to separate was recorded.

Observation:

The prepared jelly showed good spreadability, indicating a smooth and uniform texture

6.5 Content Uniformity

- Content uniformity ensures that the active ingredient is evenly distributed throughout the formulation.
- **Procedure:**
- Samples of the jelly were taken from different portions of the formulation and analyzed to determine the amount of creatine monohydrate present.
- **Observation:**
- The results showed uniform distribution of creatine monohydrate in the jelly formulation.

6.6 Stability Studies

- Stability studies are conducted to determine the physical and chemical stability of the formulation over time.
- **Procedure:**
- The prepared jelly was stored under different storage conditions such as room temperature and refrigerated conditions. The samples were evaluated periodically for changes in color, texture, odor, and consistency.
- **Observation:**
- The jelly formulation remained stable without significant changes in its physical properties during the study period

VII. Results and Discussion

7.1 Physical Appearance

- The prepared creatine monohydrate jelly was visually inspected to evaluate its color, texture, clarity, and homogeneity. The jelly formulation appeared smooth, transparent, and uniform in

appearance. It showed no signs of air bubbles, lumps, or particulate matter. The pleasant color and smooth texture improved the overall acceptability of the formulation.

- The proper gel formation indicated that the selected gelling agent and its concentration were suitable for preparing the jelly formulation.

7.2 pH Analysis

- The pH of the jelly formulation was measured to ensure its suitability for oral consumption and product stability. The observed pH of the formulation was found to be within the acceptable range for oral preparations.
- Maintaining an appropriate pH is important because extreme pH levels can affect the stability of the formulation and the effectiveness of the active ingredient. The obtained pH results indicated that the formulation was stable and safe for consumption.

7.3 Viscosity

- Viscosity plays an important role in determining the consistency and stability of the jelly formulation. The viscosity of the prepared creatine monohydrate jelly was found to be appropriate, indicating good gel strength and proper formulation.
- Adequate viscosity ensures that the jelly maintains its semi-solid structure while remaining easy to consume. The results confirmed that the concentration of the gelling agent used in the formulation was suitable.

7.4 Spreadability

- The spreadability test was conducted to determine the ease with which the jelly spreads under applied pressure. The results showed that the prepared jelly exhibited good spreadability.
- Good spreadability indicates that the jelly has a smooth and uniform texture. It also reflects proper gel formation and balanced viscosity of the formulation.

7.5 Content Uniformity

- Content uniformity testing was performed to ensure that creatine monohydrate was evenly distributed throughout the jelly formulation. The analysis showed that the active ingredient was uniformly distributed in the prepared jelly.
- Uniform distribution of the active ingredient is important to ensure that each portion of the jelly provides the intended amount of creatine monohydrate.

7.6 Stability Studies

- Stability studies were conducted to evaluate the physical stability of the jelly formulation during storage. The formulation was stored under normal storage conditions and periodically observed for any changes in appearance, texture, color, or odor.
- The results showed that the jelly formulation remained stable throughout the study period without significant changes in its physical properties. This indicates that the selected ingredients and formulation method were suitable for preparing a stable creatine monohydrate jelly.

VIII. Conclusion

The present study focused on the formulation and development of creatine monohydrate jelly as a novel and convenient dosage form. Creatine monohydrate is widely used as a nutritional supplement for improving muscle strength, enhancing physical performance, and supporting energy metabolism. However, conventional dosage forms such as powders and capsules may not always provide ease of administration or good palatability for all users. In this project, an attempt was made to develop a jelly-based formulation containing creatine monohydrate using suitable gelling agents, sweeteners, preservatives, and flavoring agents. The jelly dosage form was selected because of its advantages such as improved taste, ease of consumption, and better patient compliance. The formulated jelly was evaluated using different parameters including physical appearance, pH, viscosity, spreadability, content uniformity, and stability studies. The results of these evaluation tests indicated that the prepared creatine monohydrate jelly possessed satisfactory characteristics. The formulation showed good gel

consistency, uniform distribution of the active ingredient, acceptable pH, and desirable texture. The stability studies also confirmed that the jelly formulation remained stable under normal storage conditions without significant changes in its physical properties. The pleasant taste and semi-solid nature of the jelly make it a suitable alternative to traditional creatine supplements. Thus, the developed creatine monohydrate jelly formulation can be considered a promising and innovative nutraceutical dosage form that enhances convenience, palatability, and user acceptability.

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Rationale

- Improves muscle strength and physical performance.
- Provides an easy-to-consume alternative to powders and capsules.
- Enhances patient/user compliance due to better taste and convenience.
- Offers accurate dosing in an attractive jelly dosage form.