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"FORMULATION AND EVALUATION OF FAST DISSOLVING ORAL TOOTHPASTE PAPER STRIPS FOR ENHANCED ORAL HYGIENE"

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ABSTRACT:

As a novel strategy to enhance oral hygiene and patient compliance, the current study focuses on the creation and assessment of fast-dissolving oral toothpaste paper strips. Fast dissolving oral strips are thin, flexible films that dissolve quickly when they come into touch with saliva. This eliminates the need for water and makes them very practical for use while on the go. Numerous physicochemical and performance metrics, including thickness, weight uniformity, folding endurance, surface pH, disintegration duration, drug content uniformity, and in vitro dissolution profile, were assessed for the produced strips. The results showed that the prepared strips were homogeneous, mechanically stable, and quickly disintegrated in a matter of seconds, guaranteeing prompt release of active substances in the oral cavity.

Compared to traditional toothpaste, the new fast-dissolving toothpaste strips provide a number of benefits, such as mobility, accurate dosage, increased patient compliance, and appropriateness for both pediatric and elderly populations. As a result, this innovative dosage form offers a viable substitute for more convenient and efficient oral care delivery systems.

KEYWORDS: Antioxidant, Formulation, Antimicrobial, Evaluation, Toothpaste.

1. INTRODUCTION:

A vital component of overall health and wellbeing, oral hygiene has a substantial impact on systemic disorders like diabetes, respiratory infections, and cardiovascular diseases. The oral

cavity is a major entry site for bacteria, which makes it extremely vulnerable to periodontal disorders, gingivitis, dental caries, and plaque production. Dental caries continues to be one of the most common chronic illnesses affecting people of all ages, according to global health surveys. Thus, it is crucial to maintain good dental hygiene using efficient cleaning techniques.

In the past, dentifrice items like toothpaste, tooth powder, and mouthwash have been used to maintain oral hygiene. The most widely used of these is toothpaste, which usually contains abrasives, humectants, binders, surfactants, flavoring agents, sweeteners, preservatives, and therapeutic agents like fluorides and antibacterial chemicals. Conventional toothpaste formulations are effective, but they offer some drawbacks, such as the need for water to be used, heavy packaging, transportation challenges, and the possibility of misuse or waste. They might also be inconvenient to use when traveling, engaging in outdoor activities, or in circumstances where access to water is restricted.

A fundamental change toward the creation of innovative drug delivery methods that improve patient compliance, convenience, and effectiveness has occurred in recent years. Fast-dissolving oral films (FDOFs), sometimes referred to as dissolving films or oral strips, are one such cutting-edge method. These are incredibly thin, flexible, and biodegradable polymeric films that quickly break down when they come into contact with saliva, allowing the active chemicals to be released straight into the oral cavity. Because of its quick onset of action and simplicity of use, oral film technology has been extensively investigated in pharmaceutical applications for the delivery of medications such analgesics, antiemetics, and antihistamines.

When applied to the tongue or teeth, the strip absorbs saliva, quickly hydrates, and dissolves in a matter of seconds, creating a homogenous paste-like layer that provides medicinal ingredients and makes mechanical cleaning easier. By ensuring consistent ingredient distribution throughout the oral cavity, this special mechanism improves the effectiveness of plaque removal, breath freshening, and microbial control. Furthermore, these strips are especially useful for usage in distant locations, during travel, in combat operations, and for people with physical restrictions because they don't require water.

Additional advantages of fast-dissolving toothpaste strips include precise dosage, enhanced stability, decreased contamination risk, minimal packaging needs, and environmental sustainability because of their biodegradable nature. Their portability and ease of use are further enhanced by their small size and lightweight construction.

However, careful consideration of numerous formulation and assessment parameters is necessary for the successful development of such formulations. Film thickness, tensile strength, folding endurance, surface pH, disintegration duration, uniformity of drug content, and stability in various environmental settings are some of these. One of the main challenges in the composition of oral films is ensuring the best possible balance between mechanical strength and quick disintegration.

The creation and assessment of fast-dissolving oral toothpaste paper strips as a novel and sustainable substitute for traditional oral hygiene products is the main focus of this study. The goal of the research is to create a stable and efficient formulation that offers improved dental care advantages and quick breakdown. In order to guarantee product quality, safety, and patient acceptability, the study also highlights the assessment of physicochemical parameters and performance characteristics.

2. Fast Dissolving Oral Toothpaste Paper Strips:

A contemporary oral care product, Fast Dissolving Oral Toothpaste Paper Strips are thin, paper-like films made of toothpaste ingredients that quickly dissolve in the mouth without the need for water. Dentifrice (tooth-cleaning) agents are embedded in ultra-thin, biodegradable polymeric films called fast dissolving oral toothpaste paper strips. These films quickly break down in saliva to generate a paste-like substance that can be used to clean teeth and maintain oral hygiene.

- It is toothpaste in the form of a paper strip.
- When placed on the tongue or teeth, it dissolves within seconds.
- It works like regular toothpaste but without water and without a tube.

3. Advantages of Toothpaste Paper Strips:

1. Useful for children and elderly
2. Reduces toothpaste wastage
3. Improves patient compliance
4. Hygienic and easy to use
5. Fast dissolving (within seconds)
6. No water required
7. Portable and travel-friendly
8. Pre-measured dose
9. Safe for children and elderly people

10. Convenient for travel and outdoor use

4. Formulation Ingredients for Toothpaste Paper Strips:

Table No. 1 Formulation Ingredients for Toothpaste Paper Strips:

Sr. No	Ingredients	Quantity
1.	Starch	2.2 gm
2.	Glycerin	0.8 ml
3.	Calcium Carbonate	2.2 gm
4.	Sodium Bicarbonate	0.6 ml
5.	Neem extract	0.5 ml
6.	Tulsi extract	0.5 ml
7.	Clove oil	0.05 ml
8.	Peppermint oil	0.05 ml
9.	Sorbitol	0.5 ml
10.	Sodium Benzoate	0.015 ml
11.	Distilled water	q. s up to 25 ml.

Formulation Weighing Ingredients:

Fig. No. 1 Formulation Weighing Ingredients.

5. Method of preparation: -

1. Dissolve starch in warm distilled water with continuous stirring and heat to form gel.
2. Add glycerin and mix until uniform
3. Add calcium carbonate and sodium bicarbonate slowly with stirring. Add neem extract, tulsi extract, clove oil, peppermint oil and sorbitol.
4. Add sodium benzoate as preservative. Pour the solution onto a clean glass plate. Spread it uniformly to form a thin film.
5. Dry at room temperature or oven (40–50°C)
6. Cut the dried film into small strips
7. Packaging of Toothpaste Paper Strips.
8. Stire in well closed container.

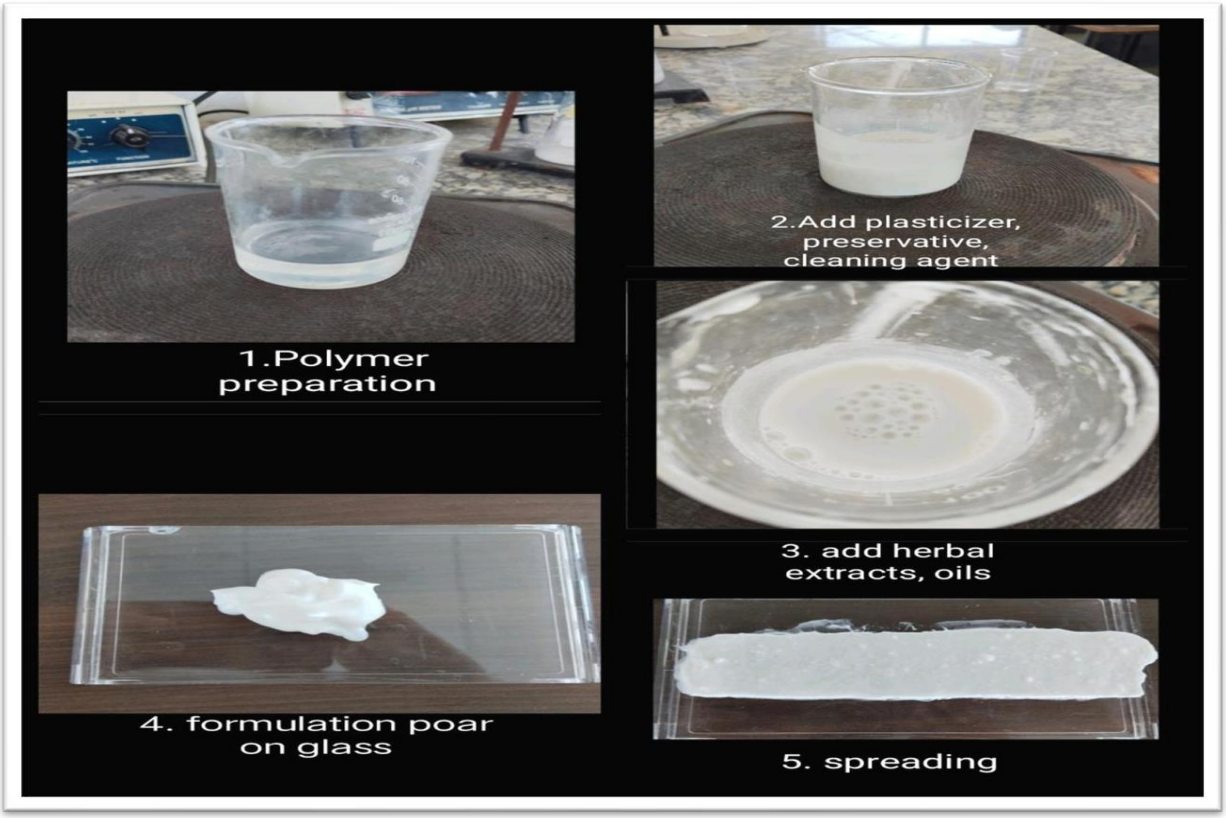

Fig. No 2 Method of preparation.

6. Evaluation parameters of Toothpaste Paper Strips:

1. Physical Appearance

- Color, transparency, smoothness
- Uniformity of film/strip

2. Thickness

- Measured using micrometer
- Ensures uniform drug distribution

3. Weight Uniformity
- Consistency of individual strips

4. Folding Endurance
- Number of times strip can be folded at same point without breaking

5. Surface pH
- Should be close to oral cavity pH (6.5–7.5)
- To avoid irritation

6. Disintegration Time
- Time taken to dissolve in saliva/water
- Key parameter for fast dissolving systems

7. Moisture Content / Loss on Drying
- Determines stability and storage suitability

8. Tensile Strength
- Mechanical strength of strip
- Resistance to breakage

9. Drug Content Uniformity
- Ensures uniform distribution of active ingredients

10. Surface Smoothness / Texture
- Mouthfeel acceptability

11. In-vitro Dissolution Study
- Rate and extent of release of active ingredients

12. Stability Studies
- Physical and chemical stability over time

7. Physical Evaluation Parameter and Results of Toothpaste Paper Strips:

Table No. 2 Physical Evaluation Parameter of Toothpaste Paper Strips:

Sr. No	Parameter	Observation
1.	Color	Brown
2.	Oduors	Characteristics
3.	Appearance	Soft
4.	Texture	Smooth
5.	Irritation	No Irritation
6.	Solubility	Soluble in water

7.	Spread ability	Uniform
8.	Stability	Stable at Room Temp.
9.	Consistency	Semisolid
10.	Homogenecity	Good
11.	Smoothness	Smooth
12.	Taste	Sweet
13.	Abrasiveness	Good abrasive
14.	Foamability	Good

8. Final Prepared Sample:

Fig. No 3 Final Prepared Sample.

9. CONCLUSION:

Using appropriate film-forming polymers, plasticizers, and dentifrice agents, the study successfully created oral toothpaste paper strips that dissolve quickly. Excellent physicochemical and mechanical qualities, such as consistent thickness, smooth texture, flexibility, and sufficient folding endurance, were displayed by the produced strips, suggesting acceptable formulation stability and handling qualities.

The strips' effective delivery of active substances in the oral cavity is confirmed by their speedy breakdown under simulated salivary circumstances. This guarantees that flavoring, antibacterial, and cleansing chemicals work instantly, promoting good dental hygiene. This system's water-free application is one of its main advantages, making it ideal for usage in travel, emergency scenarios, and places with poor water availability. Furthermore, the strips' unit-dose design guarantees precise and reliable distribution of active substances, cutting down on waste and enhancing patient compliance.

From a pharmaceutical and industrial standpoint, these strips present exciting prospects for innovative medication delivery methods, advancements in oral hygiene, and environmentally responsible packaging options. For specific oral health benefits, they may also include medicinal or herbal substances. To sum up, fast-dissolving oral toothpaste strips are a novel, effective, and patient-friendly invention in oral hygiene technology that has great promise for

further research and commercialization.

10. Conflict of Interests:

- The authors affirm that the work presented in this paper was not influenced by any known competing financial interests or personal relationships.

11. Acknowledgment:

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