

Formulation and Antibacterial Evaluation of *Acmella oleracea* (Akarkara) Gummies Used for Toothache

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ABSTRACT

Medicated gummies is of the innovative novel dosage forms that, will have a significant impact on the pharmaceutical industry. Dental disorders are more common in children and adult also. In Ayurveda, *Acmella oleracea* has mentioned as plant for toothache, it also has immune-modulating, antioxidant, antibacterial, anti-septic, analgesic, anti-inflammatory, insecticidal, and anesthetic properties. The current research work base on formulation and antibacterial evaluation of *Acmella oleracea* gummies. The type and concentration of gelling agent used in this study was investigated in relation to the physical characteristics of the chewable gummy tablets, including their visual appearance, weight variation, tablet dimension, swelling ratio, and texture profile (hardness, chewiness and gumminess). antibacterial activity of gummies was evaluated against dental common bacteria *S. mutant*.

Keywords: *Acmella oleracea*; Toothache plant; Chewing gummies; Antimicrobial activity

INTRODUCTION

Poor oral health, periodontitis can result in poor overall health. Research highlights an important link between oral health and whole-body health. People with periodontitis have a higher risk of developing heart disease, stroke, dementia and other serious health issues. Periodontal disease is inflammation and infection of gums and the bone that supports teeth. It can be a result of poor hygiene, but some people are more prone to this type of infection. Symptoms may include bad breath, loose teeth and bleeding, swollen gums. There are many treatments available, depending on the severity of disease. Since ancient times, the star-shaped blossoms of *Acmella oleracea* also known as "Akarkara", have been used in traditional medicine to cure psoriasis, sever tooth pain, gum and throat infections, and tongue paralysis. *Acmella* is generally called as "toothache plant". It functions as an immunomodulatory as well. It possesses a number of qualities, including diuretics immune-modulating, antioxidant, antibacterial, anti-septic, analgesic, anti-inflammatory, insecticidal and anaesthetic effects. India is home to almost 17,000 flowering plants and is one of the world's twelve mega heterogenietal nations. The Eastern Himalayas and the Western Ghats are India's two hotspots out of the world's 25 hotspots. Herbal medications are a significant component of

health care initiatives, particularly in underdeveloped nations. Known by most as "Akarkara". *Spilanthes acmella* is an annual herb with hair that grows up to 32 cm-60 cm tall. Its extract is used in oral health care for the treatment of sore throat, oral ulcer, gingivitis, and general toothache. *S. mutans* plays a vital role in the adhesion and colonization of various microorganisms within the oral cavity by adhering to dental surfaces covered with salivary protein membranes. Antibacterial activity was carried out against *S. mutans* [1].

MATERIALS AND METHODS

Phytochemical detection

Standard procedures were followed in the screening of the different chemical components. Alkaloids were tested by Meyer's test, and Dragendroff's test; carbohydrates by Wagner's test, Hager's test, Molisch's test, Fehling's test, Barfoed's test, and Benedict's test; phytosterols by Liebermann Burchard's test, and Salkowski reaction; glycosides by Legal's test, and Keller Killiani's test; tannins by FeCl₃ test, K₂Cr₃O₇ test, and lead acetate test; saponin by foam test [2].

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Method of preparation of gummies

The distilled water was added to the gelatin, and it was allowed to swell for 30 minutes at room temperature. The mixture of water and gelatin was cooked to 50 degree Celsius in a water bath until a uniform, viscous liquid formed. An accurate amount of sucrose was dissolved in purified water and continuous stirring in mixing pan. Mannitol was mixed with corn oil, then this mixture added in sucrose solution. Propylenegluocol was added to mixture while stirred continuously. Dissolve citric acid, sodium benzoate in gelatin solution then add sucrose solution with continuous stirring. When temperature reached 60°C, the Akarkara extract was added gradually into the mixture then stirred homogeneously for 10 minutes. After being thoroughly mixed, the prepared material was poured into the silicon mold. Room temperature was maintained for the molds for setting gummies. Then packed individually in butter paper and stored in an airtight jar for further analysis [3].

Agar plate preparation

Agar plate prepared from using agar powder and plate used for agar test. agar plate specially designed for gram negative bacteria. In agar, only gram-negative bacteria proliferate. Additionally, it distinguishes between gram negative bacteria that digest lactose and those that do not. A colony of lactose fermenting bacteria has a pinkish-red color. A bacterial colony that does not digest lactose appears colorless.

Procedure

Take a solution having specific bacteria *S. mutans* (any bacteria take in this medium which is sensitive plant). Place the hot agar solution in a petri dish and cool it in the room temperature. Autoclave the petri dish for 24 hours. Spread the bacteria layered on petri dish and incubate at 25°C. Petri disc deep in the extract medium. Ethanol sock by paper disc is an allow to evaporate. Paper disc of extract placed on petri plate, apart from this extract treated paper disc, one more paper disc as a control it used for the comparison of this paper disc only sock in an alcohol. Compare diameter of inhibition zone which is around the paper disc [4].

RESULTS AND DISCUSSION

This study used 5% gelatin to create chewing gummies containing powdered *Acmella oleracea* flowers. From an organoleptic perspective, each gummy was shaped like a square or rectangle, with a translucent brown color, a vanilla scent, and a sweet flavor. This uniform appearance demonstrates a favorable influence on the acceptance and perception of consumers. The texture had a sufficient gel strength and was

chewy, elastic, and non-sticky. In this investigation, every prepared gummy weighed between 2.5 and 3.2 grams. The gummies have a neutral pH of 7, making them easy for the body to absorb. The outcome demonstrated that no single tablet was heavier than the weight required by the pharmacopoeia, suggesting that the powdered *Acmella oleracea* flower was evenly distributed throughout all of the manufactured tablets.

The fractional weight increases of the gel system brought on by water absorption are known as the swelling ratio. The purpose of the swelling ratio test was to gauge how well the gummies could absorb molecules from the interior of the structure. The ability of the gummies to capture water molecules increases with swelling ratio. With the help of water molecules, gelatin created three stabilized structural dimensions by either forming a new hydrogen bond or stabilizing an existing one. To make sure the gummies dissolve when they come into contact with saliva, the dissolution time was measured to determine how rapidly the gummies dissolve in aqueous conditions. A shorter dissolving time means that the active substances in the dosage form will dissolve more quickly, and the absorption process will begin more quickly at the site of contact with the dental area, which is infected or swollen. According to a prior study, gummies that are approved by the FDA should dissolve in 15 minutes. Hydrophobic contact and hydrogen bonding may be involved in the development of gels. Conversely, gelatin is hygroscopic, which means that water is easily absorbed and held in a gel structure by it. Rapid dispersion and release of *Acmella oleracea* flower powder were noted throughout the investigation because gelatin created rigid structures but soft and more chewable gummy tablets. Hardness in the gummies is correlated with the gel structure's strength under compression. The greatest force needed to compress candies in between molar teeth is known as hardness.

Gumminess is the relationship between a food product's cohesion and hardness. Gumminess is a property of semisolid preparations that have a high cohesion and low hardness. Chewiness is a term used to characterize the degree of chewability and elastic hindrance experienced during the mastication process of gummy tablets. It calculates how much energy must be expended chewing food before swallowing it [5-7].

Physical characteristics of the prepared *Acmella oleracea* chewable gummies

The hardness of gummies was found to be $400.2 \pm 25.23 \text{ N} \times \text{mm}$, while gumminess of gummies found to be $37.54 \pm 3.50 \text{ N} \times \text{mm}$ (Tables 1 and 2).

Table 1: Physical and chemical properties *Acmella oleracea*.

Parameters	Result
Organoleptic	Color
	Brown

	Taste	Sweet
	Flavor	Vanilla
	Shape	Square and rectangular
Texture		Non sticky, elastic
Swelling ratio (%)		0.53 ± 0.01
Dispersion time (minutes)		10.5 ± 0.10
Average weight		2.5 ± 0.02
Tablet dimensions	Length (cm)	1.26 ± 0.01
	Width (cm)	1.28 ± 0.01
	Thickness (cm)	1.12 ± 0.01
Texture analysis	Hardness (N × mm)	400.2 ± 25.23
	Chewiness (N × mm)	90.15 ± 9.5
	Gumminess (N × mm)	37.54 ± 3.50

Table 2: Antibacterial activity of the prepared *Acmella oleracea* chewable gummies.

Organism	Dose (mg)	Zone of inhibition (mm)
<i>Staphylococcus mutans</i>	200	0.9
	300	11 mm
	500	14 mm

This outcome demonstrates the chewing gummies' *Acmella oleracea* flower powders has good antibacterial properties. This is because the flower portion of *Acmella oleracea* includes phytochemicals known to be antimicrobials, such as tannins and flavonoids [8-10].

CONCLUSION

Chewable gummies, this dosage forms promote patient compliance and are well liked by both parents and children while yet retaining good effectiveness and bio availability. The gummies were prepared by melt granulation method. The gummies were tested for different evaluation parameters such as physical appearance, thickness, hardness, weight variation, drug content. The gummies tested were found to be within the range for all the evaluation parameter also the technique is simple, economical and time saving. As a result of their many additional benefits, such as patient compliance, convenience and comforts for effective treatment, including low dose, immediate onset of action and economical factor, medicated gummies will be the ideal dosage form for the paediatric patient. They will provide a

more effective and creative dosing form. *Acmella oleracea*, commonly known as the toothache plant, where it is most commonly used to treat toothaches. This plant shows other pharmacological activities including antioxidant, anti-inflammatory, antimicrobial, Immunomodulatory, antifungal activity.

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