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Preparation Of Herbal Candy To Prevent Dental Caries And Boost Overall Health In Children

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ABSTRACT

Objectives: Candy is more generally appertained to as “Fun Food”. Inordinate consumption of candy has a negative impact, in which it causes dental caries and health issues. There is a growing shift from the use of conventional pharmaceutical oral care products to the use of herbal excerpts and traditional remedies in dental caries forestallment. The formulation of Herbal sugar-free candy that prevents dental caries and boosts overall health in individuals is expected to solve this problem.

Study Design: Original Research article

Place And Duration Of Study: Mansarovar Dental College, Hospital and Research Centre, Bhopal from 1st July,2024 to 1st July,2025.

Materials And Method: As per the ancient ayurveda textbook and ultramodern exploration, it has been proven that Amla, honey, beeswax and herbal extracts such as Triphala(relieves tooth decay), Miswak(removes plaque), Vai vidanga(Fights dental caries), Nirgundi(relieves tooth ache), Khadira(tightens gums), Bakula(strengthens gums and teeth), Babool(prevent gum bleeding), Irimeda(improves gum health), neem(fights germs) are said to prevent tooth decay and boosts overall health in individuals.

Vitamin C rich amla (scientifically known as Emblica officinalis) is used for preventive disease health management strategies.

For the formulation of candy, honey-soaked amla is taken and grinded well with all the herbal excerpts mentioned over along with honey and beeswax. All the constituents are blended well to get a fine slurry texture.

Result: This study reveals that Herbal candy is effective in reducing cariogenic bacterial count.

Conclusion: However, further exploration is needed to assess their anti-microbial activity and to estimate the cytotoxicity and safety profiles of these herbal candy before its widespread clinical use can be recommended.

Keywords: *Amla, anti-bacterial, beeswax, Herbal extracts*

1. INTRODUCTION

Inordinate consumption of candies has a negative impact, and causes Dental Caries and health issues. In recent years, there has been a growing shift from the conventional medicinal oral care products to the application of traditional herbal remedies for promoting dental care and boosting overall health in children. These factors impact the confectionary market and they are perfecting their product with technologies and constituents that meet consumer's requirements.

Candy is a top-rated confectionery product among all age groups, especially in children, because it has high organoleptic pointers and low price. However, candy has low nutritive value, so it is worthwhile to develop a good quality candy to add functional ingredients and herbs according to the market demand.

Dental caries affects 60–90% of school-aged children globally, with sticky snacks being a primary etiological factor. Conventional treatments, such as fluoridated products, face limitations due to toxicity concerns and antimicrobial resistance. Accordingly, the World Health Organization calls for natural preventive strategies.

The expression of herbal sugar-free candy that prevents dental caries and boosts overall health in individualities is anticipated to solve these problems.

Preparation from plants and herbal excerpts have been used since ancient times to combat various systemic ailments and oral conditions. The oral diseases are caused by over 300 different species of microorganisms. Thus, the current research was formulated with the aim to use natural herbal excerpts for better health.

Natural products basically favor health over chemicals, furnishing relief in a further provident way. Ayurvedic textbooks emphasize herbs like Amla, Triphala, and Miswak for oral health, supported by ultramodern research validating their antimicrobial and anti-inflammatory properties . The present exploration utilizes Amla, honey, beeswax, Ashwagandha, Miswak, Vai vidanga, Triphala, Bakul chhal. Khadira and Yashtimadhu to prepare a formulation that prevents tooth decay due to their significant properties.

Candy consumption is deeply hardwired in pediatric culture, yet traditional phrasings complicate caries threat. This study addresses the gap by developing a sugar-free herbal candy that combines taste with therapeutic benefits. The formulation replaces refined sugars with honey, a low-glycemic sweetener with essential antimicrobial parcels and integrates bioactive herbs to disrupt cariogenic biofilms and enhance remineralization.

2. DENTAL CARIES: CAUSES AND PREVENTION

Dental caries is a dynamic process characterized by the interplay between pathogenic microorganisms, dietary sugars, and host factors. The primary etiological agents, Streptococcus mutans and Lactobacillus species, metabolize fermentable carbohydrates to produce acids, leading to the demineralization of the tooth enamel. Contributory factors include:

1. Bacterial Exertion – Streptococcus mutans and Lactobacillus bacteria metabolize sugars, producing acids that demineralize enamel.
2. Sugar Consumption – Frequent intake of sticky and starchy foods energies bacterial acid production.
3. Poor Oral Hygiene – Inadequate brushing and flossing allow plaque buildup, promoting decay.
4. Acidic diet – Acidic foods and drinks erode enamel, making teeth more susceptible.
5. Saliva Deficiency – Saliva neutralizes acids and provides minerals for remineralization; low production increases caries threat.

Prevention of Dental Caries:

Preventive measures focus on reducing bacterial activity, strengthening enamel, and maintaining oral hygiene:

1. Brushing and Flossing – Regular brushing with fluoride toothpaste and daily flossing remove plaque.
2. Fluoride Use – Fluoride strengthens enamel and promotes remineralization, available in toothpaste, mouthwash, and water supplies.
3. Healthy Diet – Limiting sugar intake and consuming fiber-rich foods promote saliva flow and protect teeth.
4. Regular Dental Checkups – Professional cleanings and early detection help prevent caries progression.
5. Dental Sealants – Defensive coatings applied to molars prevent bacteria from settling in grooves.
6. Chewing Sugar-Free Gum – Increases saliva production, abetting in acid neutralization.

3. MATERIALS AND INGREDIENTS

1. Amla (Emblica officinalis): Rich in Vitamin C, flaunting antioxidant, anti-inflammatory, and antimicrobial parcels.

2. Honey: Natural sweetener with essential antimicrobial exertion, serving as a binder.

3. Beeswax: Provides structural integrity and acts as a texture stabilizer.

4. Triphala Powder: A combination of Haritaki (Terminalia chebula), Bibhitaki (Terminalia bellirica), and Amla, known for its anti-inflammatory and antimicrobial effects.

5. Miswak (Salvadora persica) Extract: Contains fluoride and silica, abetting in plaque reduction and enamel strengthening.

6. Vai Vidanga (Embelia ribes) Excerpt: Exhibits anticariogenic exertion through its antibacterial parcels.

7. Khadira (Acacia catechu) Bark Extract: Strengthens gums and possesses antimicrobial attributes.

8. Yashtimadhu (Glycyrrhiza glabra) Root Powder: Soothes oral tissues and reduces plaque accumulation.

9. Bakula (Mimusops elengi) Bark Excerpt: Enhances gum health and provides antimicrobial benefits.

10. Ashwagandha (Withania somnifera) Root Powder: Offers antioxidant effects and supports stress relief.

Equipments used:

-Grinder/Disintegrator: To pulverize herbal constituents into fine powders.

-Blender: For uniform mixing of components.

-Weighing Scale: To ensure precise measurement of constituents.

-Sealing Machine: For packaging the final product.

4. BENEFITS OF HERBAL CONSTITUENTS

1.AMLA, also known as Indian gooseberry, is a hustler of nutrients and offers several health benefits, like-

-Antioxidants properties

-Antimicrobial and anti-inflammatory properties, that prevents gum diseases.

-The Vitamin C contents in amla helps in the production of collagen, which is essential for strengthening teeth.

-The antimicrobial property of amla helps in precluding tooth decay.

-Halitosis forestallment: Amla can help combat bad breath by killing bacteria in the mouth and perfecting overall hygiene.

-Digestive support: It supports digestive health by balancing stomach acids and enhancing the immersion of nutrients.

-Cardiovascular benefits: Assists in regulating lipid profiles and blood pressure.

-Blood Sugar Regulation: It also regulates blood sugar levels.

2.HONEY: It has been valued for its medicinal properties for centuries.

-Natural sweetener

-Used as binder

-Antimicrobial property: Fights bacteria and prevents cavities, as unlike refined sugars, honey does not contribute tooth decay.

-Its anti-inflammatory property helps in healing mouth ulcers and injuries.

-It reduces plaque buildup and hence prevents gingivitis and periodontitis.

-It strengthens the immune system.

-Regulates blood sugar: Unlike processed sugar, honey has a lower glycemic index.

- As per the ancient ayurveda textbooks and ultramodern exploration it has been proven that beeswax, triphala, Khadira, vai vidanga, miswak, nirgundi, trimeda, ashwagandha, yashtimadhu, bakul chhal are set to prevent tooth decay and overall health in individualities.

3. BEESWAX: It has been used as natural tooth fillings in certain home remedies, as it provides a defensive layer.

-Provides structural integrity and acts as a texture stabilizer.

-It helps in guarding gums from irritants.

4.TRHIPALA: An ancient ayurvedic herbal admixture made from amla, haritaki and bibhitaki.

-It is well known for its anti-inflammatory and anti-bacterial properties.

-It can help combat bacteria that lead to gum disease and bad breath.

-It helps in reducing oral plaque and prevents tooth decay.

5.MISWAK: Derived from Salvadora persica tree, it is rich in fluoride, silica that helps to prevents plaque buildup, reduce cavities and whiten teeth.

-It strengthens the gums.

-It has natural anti-bacterial properties.

6.KHADIRA; Deduced from Acacia catechu tree, it has antimicrobial and anti-inflammatory properties.

-Natural teeth whitener.

-Helps reduce bad breath and gingivitis.

7.VAI VIDANGA: It has anti-bacterial property that help combat dangerous bacteria from the

mouth.

-Reduces plaque, gingivitis and tooth decay.

8.ASHWAGANDHA: It has anti-oxidant and anti-inflammatory properties

-It helps in stress relief

9.YASHTIMADHU:Also known as licorice root.

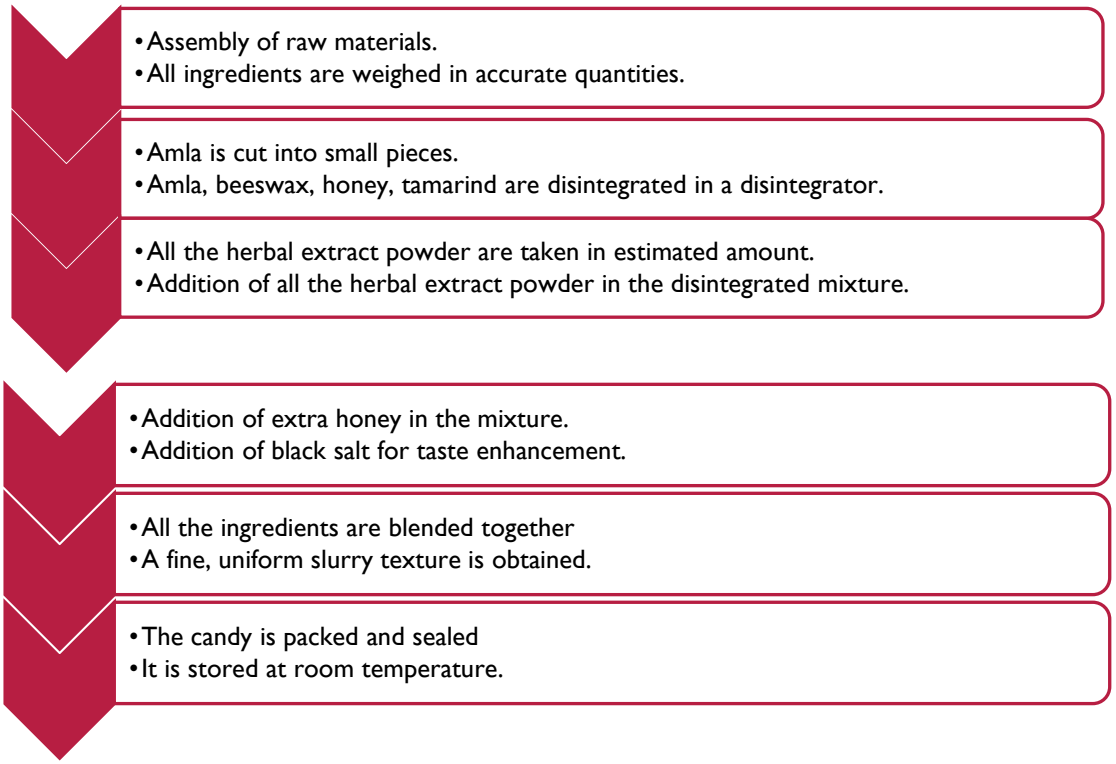
-Its antimicrobial properties help in reducing plaque formation.

-Soothes gum inflammation.

-Prevents cavities.

10.BAKUL CHHAL: Deduced from the bark of the Mimusops elengi tree, it has natural antimicrobial properties and treats bleeding gums.

5. PROCEDURE AND PREPARATION



Candy consumption is deeply hardwired in pediatric culture, yet traditional phrasings complicate caries threat. This study addresses the gap by developing a sugar-free herbal candy that combines taste with therapeutic benefits. The formulation replaces refined sugars with honey, a low-glycemic sweetener with essential antimicrobial parcels and integrates bioactive herbs to disrupt cariogenic biofilms and enhance remineralization.

6. HERBAL ACTIVES

These are usually used in moderate quantities for efficacy without overpowering the flavor or causing GI irritation.

Ingredient	Functional Role	Workable Range (g/100g)	Notes
Amla Pulp	Base, Vitamin C, tartness	15–30 g	Provides texture and tang; core carrier.
Honey	Natural sweetener, binder	10–30 g	Can reduce if xylitol is used; affects texture and water activity.
Xylitol Powder	Sugar substitute, sweetness	10–30 g	Cooling effect; adjust for total sweetness with honey. Not suitable for high heat (melting point ~92°C).
Beeswax	Binder, gloss, chewiness	1–3 g	Used in low quantities for mouthfeel or surface finish.
Triphala Powder	Digestive aid, antioxidant	0.5–2 g	Very bitter; must be masked with sweeteners.
Miswak Powder	Oral care, antimicrobial	0.2–1 g	Pungent; traditionally used for oral health.
Vaya Vidanga Powder	Anthelmintic, pungent	0.2–1 g	Slightly spicy/medicinal; combine with cooling herbs.
Khadira	Astringent,	0.5–1.5 g	Balances oral health ingredients; adjust

Base and Functional Binders

These ingredients help with structure, palatability, and medicinal delivery.

Ingredient	Function	Broad Range (per 5g candy)	Notes
Honey	Natural sweetener, antimicrobial	500–2000 mg (0.5–2 g)	Aids in binding and taste.
Beeswax	Binder, texture control	50–150 mg	Use only if making a lozenge-type candy; not suitable for hard candy.
Xylitol	Sweetener, oral health benefit	500–2000 mg	Helps mask bitterness, non-cariogenic.

Formulation- Xylitol + Honey: Can work synergistically for sweetening and moistness, used xylitol in cool mixing stages.

Taste masking: Ashwagandha, Triphala, and Vidanga are potent. Increase yashtimadhu, honey to balance flavour.

Final form: soft chewy candy

Total Formulation Consideration

• Target weight per candy: 3–5 g

• Total active herbal load: 300–800 mg (can vary)

• Sweeteners and base (honey + xylitol): 1.5–3.5 g

• Binder/stabilizers (beeswax, gum, etc.): 50–300 mg

7. EVALUATION TEST

1. Sensory test: To estimate the taste, smell, color, of the herbal candy
2. Sugar content assessment: To assess the chance of sugar in it.
3. Microbial quality of candy: All the samples were subordinated to microbiological analysis.
4. Cost analysis: The cost of functional candy was calculated using the standard methods by considering all cost of raw materials and processing charges at the laboratory level.
5. We conducted a google form survey on our project titled "Preparation of herbal candy to prevent dental caries and boost overall health in children". This survey aims to gather insight on the consumer preferences on texture, quality and acceptance of herbal-based confectionery.

8. RESULT

1.Sensory test:

-Color- Brownish

-Texture-Soft

-Smell-Pleasant

-Taste-sweet and sour

2Nutritional value analysis(gm/100gm)

1.Fat-1.41

2.Protein-0.90

3.Total sugar-17.80

4.Moisture-2.72

5.pH-5.71

3.Heavy Metals[mg/kg]

1.Mercury- < BLQ

2.Lead-< BLQ

3.Arsenic-< BLQ

4.Cadmium-< BLQ

BLQ: Below the limit of detection

4.Microbiological analysis

1.Total bacterial count-7.8*10^2

2.E.coli- Absent

3.S.aureus-<10.00

4.B. cereus-<10.00

5.Salmonella-Absent

Honey's antibacterial properties flush out harmful bacteria by fighting the bacteria, honey reduces the amount of acid your mouth produces, without that acid bacteria can no longer produce dextran, which is essentially the glue that helps the bacteria attach to the tooth surface.

***Xylitol** with the Glycemic Index of just **7** is proven to prevent Dental Caries.

*Chewing these candies **prevent food lodgment** by filling up pores and crevices inside the oral cavity with the help of beeswax present in the candy as bee wax possesses antibacterial properties that kills the bacteria.

* **Beeswax** acts as an adhesive and forms a biofilm over the tooth surface. It has been in use since ancient times in Ayurveda for treating dental caries.

9. COMMERCIALIZATION POTENTIAL AND BUSINESS PLAN

a) We have analyzed the Indian confectionery market; it has the size of INR 338.8 billion and increasing at the rate of 6.3%.

b) Treating dental caries in hospitals and clinics is far more expensive.

c)Candies will be handy and much cheaper and easily accessible to the large population and Prevention is always better than cure.

TEST REPORT

Customer Name & Address	**To Anushka Gupta Address:**	**Test Report No.**	**CES/LAB/Food/27/01**
		Report Date :	**22.03.2025**
		Dispatch No.:	**683**
		Customer Ref. No.:	**Nil**
		Name & Contact Information:	**Nil**

Sample Details:

Sample Discipline	: Chemical – Food & Agriculture Products		
Sub Group:	: **Sugar Boiled Confectionery**		
Sample Name:	: **Herbal Candy**		
Quantity:	: 1 No. x 200 gm	**Date of Sampling:**	: 17.03.2025
Batch No.	: NA	**Sample Received Date:**	: 17.03.2025
Laboratory Code:	: 27/1	**Date of Analysis Started:**	: 17.03.2025
Sampling Collection:	: Client	**Date of Completion of Analysis:**	: 22.03.2025
No. of Sample	: 01	**Page No:**	: 1 of 1

S. No.	Name of Test Parameter	Unit	Test Method	Result Obtained
1	Moisture	gm/100gm	FSSAI 04C.002.2024	2.72
2	Fat	gm/100gm	FSSAI 04C.011.2024	1.41
3	Protein	gm/100gm	FSSAI 2.4.1.2016	0.90
4	Total Sugar	gm/100gm	FSSAI 2.6.2016	17.80
5	Added Sugar	gm/100gm	FSSAI 2.6.2016	Absent
6	Acidity	gm/100gm	FSSAI 2.6.2016	5.71
	Heavy Metals			
7	Mercury as Hg	mg/kg	CES/LAB/SOP/Food/09	<BLQ
8	Lead as Pb	mg/kg	CES/LAB/SOP/Food/09	<BLQ
9	Arsenic as As	mg/kg	CES/LAB/SOP/Food/09	<BLQ
10	Cadmium as Cd	mg/kg	CES/LAB/SOP/Food/09	<BLQ

BLQ: Below the Limit of Detection

For CES Analytical and Research Services (I) Pvt. Ltd

Checked By: **Authorized Signatory**

The Results relate only to the sample tested/ sampled
Note:-The Report will not valid for any legal case, if prior permission not taken from CES.

****** End of Test Report ******

TEST REPORT

Customer Name & Address	**To Anushka Gupta Address:**	**ULR No:**	**TC687225600000040F**
		Test Report No.	**CES/LAB/Food/27/01**
		Report Date :	**22.03.2025**
		Dispatch No.:	**683**
		Customer Ref. No.:	**Nil**
		Name & Contact Information:	**Nil**

Sample Details:

Sample Discipline	: Microbiological – Food & Agriculture Products		
Sub Group:	: **Sugar Boiled Confectionery**		
Sample Name:	: **Herbal Candy**		
Quantity:	: 1 No. x 200 gm	**Date of Sampling:**	: 17.03.2025
Batch No.	: NA	**Sample Received Date:**	: 17.03.2025
Laboratory Code:	: 27/1	**Date of Analysis Started:**	: 17.03.2025
Sampling Collection:	: Client	**Date of Completion of Analysis:**	: 22.03.2025
No. of Sample	: 01	**Page No:**	: 1 of 1

S. No.	Name of Test Parameter	Unit	Test Method	Result Obtained
1	Total Bacterial Count	Cfu/gm	IS:5402:2021/P-1	7.8×10^2
2	Yeast & Mould	Cfu/gm	IS:5403:1999	Absent
3	Escherichia Coli	/gm	IS:5887:1976/P-1	Absent
4	Staphylococcus Aureus	Cfu/gm	IS:5887:2002/P-8/SEC-1	<10.00
5	Bacillus Cereus	Cfu/gm	IS:5887:2012/P-6	<10.00
6	Salmonella	/25gm	IS:5887:2020/P-3/SEC-1	Absent

For CES Analytical and Research Services (I) Pvt. Ltd

Checked By: **Authorized Signatory**

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****** End of Test Report ******

10. DISCUSSION

There is a growing shift from the use of conventional pharmaceutical oral care products to the use of herbal extracts and traditional remedies in dental caries prevention. The formulation of Herbal sugar-free candy that prevents dental caries and

boosts overall health in individuals is expected to solve this problem.

-It was proven by Cruz Martinez in 2017 that medicinal herbs can be used in treating periodontal diseases.

Hence, we incorporated several herbs such as Miswak, Vai Vidanga, Brahmi, Yashtimadhu, etc in our candy.

-Many research has been performed using Xylitol for treatment of dental caries.

We have incorporated Xylitol along with the anti-cariogenic medicinal herbs for prevention of dental caries.

-As per the ancient ayurveda texts and modern research, it has been proven that Amla, honey, beeswax and herbal extracts such as Triphla(relieves tooth decay), Miswak (removes plaque), Vai vidanga(Fights dental caries), Bakula (strengthens gums and teeth), Babool(prevent gum bleeding), are said to prevent tooth decay and boosts overall health in individuals.

-Few studies have proven the anti-microbic effectiveness of beeswax against overall Streptococcus mutans, Staphylococcus aureus, Salmonella entericus, Candida albicans and Aspergillus niger, that are the most common causative organisms of dental caries. These inhibitory effects are enhanced synergistically with other natural products such as honey.

The problems that our invention addresses and how our product helps to overcome the limitations of the existing technologies-

1. Dental Caries (Tooth Decay)

Problem:

• One of the most common chronic diseases worldwide.

• Caused by acid-producing bacteria (e.g., Streptococcus mutans) that demineralize tooth enamel.

How Herbal Candy Helps:

• Contains natural antibacterial agents (e.g., honey, beeswax) that inhibit cariogenic bacteria.

2. High Sugar in Conventional Candies Problem:

• Regular candies are sugar-rich, feeding harmful oral bacteria and increasing caries risk. How Herbal Candy Helps:

• Uses non-cariogenic sweeteners like xylitol, honey.

• These sweeteners do not ferment by oral bacteria and may even inhibit their growth.

3. Dependence on Synthetic Chemicals in Oral Care Problem:

• Many toothpastes and mouthwashes use synthetic antimicrobials (e.g., chlorhexidine), which may have side effects like:

• Staining of teeth

• Taste alteration

• Disruption of oral microbiota

How Herbal Candy Helps:

• Provides a natural alternative using plant extracts with proven antimicrobial, anti-inflammatory, and antioxidant properties.

• Safer for long-term use, especially in children.

4. Low Compliance with Oral Hygiene in Children & Elderly Problem:

• Many individuals, especially children and the elderly, may not brush effectively or regularly.

• Difficulties in using toothpaste or mouthwash consistently.

How Herbal Candy Helps:

• Convenient and palatable form encourages daily use.

• Works as a complement to brushing and flossing, especially after meals or snacks.

5. . Need for On-the-Go Oral Care Problem:

• People often snack or drink sugary beverages when away from home, without brushing afterward.

How Herbal Candy Helps:

• Acts as an on-the-go oral care solution, neutralizing acid and reducing bacterial load in between brushing sessions.

6. Antibiotic Resistance Concerns Problem:

• Overuse of antibiotics can lead to resistant bacterial strains.

How Herbal Candy Helps:

• Uses non-antibiotic herbal compounds with multi-target antimicrobial action, reducing the risk of resistance.

7. Lack of Dual-Function Confectionery Products Problem:

• Most candies are purely indulgent with no functional health benefits.

How Herbal Candy Helps:

• Bridges the gap between snack and supplement: enjoyable like candy but functional like a health product.

• Offers a dual benefit: taste + oral care

HOW IS OUR SOLUTION BETTER THAN THE EXISTING SOLUTIONS

1) It is natural and all Herbal
2) It is pocket-friendly
3) No added sugar
4) No added preservative
5) No artificial sweetener
6) Eco-friendly
7) Time-saving

LIMITATIONS AND FUTURE DIRECTIONS:

While the initial results are promising, further long-term clinical trials are necessary to assess the reduction in caries prevalence and the remineralization eventuality of the herbal candy.

We look forward to introducing new flavours and candy varieties in near future.

11. CONCLUSION

The herbal candy demonstrated significant antimicrobial and antioxidant properties, aligning with Ayurvedic principles. The formulation of sugar-free herbal candy exercising traditional Ayurvedic constituents presents a promising approach to combat dental caries in children. By integrating natural antimicrobial agents and bioactive composites, this candy not only satisfies children's taste preferences but also promotes oral health. Its sugar-free composition and child-friendly taste make it a feasable alternative to conventional candies.

By integrating Ayurvedic wisdom with modern science, this formulation of sugar-free herbal candy offers a holistic approach to pediatric oral health, addressing the dual challenges of taste and therapeutic efficacy.

12. ACKNOWLEDGEMENT

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