



ALLOPOLYHERBAL FORMULATION OF ANTI-EMETIC AND STRESS RELIEVER MEDICATED CHEWING GUM

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Abstract : Aim: Allopolyherbal Formulation of Anti-Emetic and Stress Reliever Medicated Chewing Gum. Method: Chewing was prepared using Ondansetron, Ashwagandha, Caffeine, and various proportions of gum base and other excipients. The fusion technique was used to prepare chewing gum. Five formulations were prepared with different concentrations of gum base. The prepared gums were then evaluated by performing elasticity study, stability study, melting point, stickiness, physical appearance, etc. Result: After evaluating 5 different formulations of medicated chewing gum F4 and F5 were the best formulations. These formulations were best according to their, stickiness, elasticity, etc. Conclusion: Hence, medicated chewing gum having anti-emetic and stress relieving effects was successfully prepared by using a gum base.

Index Terms- Medicated chewing gum, Ondansetron, Ashwagandha, Caffeine, Antiemetic, Anti-stress, Motion sickness, Travelling stress, Fusion technique.

INTRODUCTION

Chewing gum has been used by mankind since ancient times primarily for pleasure. Human beings belonging to every culture have chewed types of gum and gum-like substances from ancient times. Chewing gums are a worldwide consumable confectionery product that can be chewed for pleasure without being swallowed. It has a rubbery texture and is composed of various ingredients such as gum base, sugar, polyols, flavoring agent, acidulates, coloring agents, high-intensity sweeteners, and different additives. Chewing gums were ranked third in the overall confectionary market, after chocolates and candies. In recent years, chewing gum being a tasty and enjoyable confectionery has proven its potential as an effective delivery vehicle for pharmaceutical and nutraceutical ingredients. As far as patient convenience is concerned chewing gum is discrete, and its administration without water promotes higher compliance. Since it can be taken anywhere, chewing gum formulation is an excellent choice for acute medication. Studies have shown that even non-medicated chewing gum stimulates saliva flow and increases plaque pH, which prevents tooth decay. Several active substances in chewing gum formulations are available commercially. Medicated chewing gum is now a well-established dosage form described in the European pharmacopeia. It offers several advantages, including the fast onset of action, avoidance of hepatic first-pass metabolism for substances absorbed via the buccal route, and possibly lower dosage requirements and hence fewer side effects. Nausea and vomiting are the most commonly occurring symptoms in most pathophysiological conditions such as motion sickness during traveling, cancer, pregnancy, and postoperative conditions. Nausea refers to the feeling of impending vomiting. Vomiting refers to forceful expulsion of contents of the stomach and the proximal small intestine. So, an attempt was made to formulate an Anti-Emetic and Stress Relieving medicated chewing gum using a natural gum base for faster onset of action and easy administration, anywhere and anytime, without access to water to the person having a problem with motion sickness and stress during traveling. Medicated chewing gums are defined as any nutrients or pharmaceutical compounds that are incorporated into chewing gums to promote specific functions in our body and prevent some disorders. It has other beneficial effects such as alertness, increasing concentration and memory power, regulation of stress, and mood changes. The oral route of drug administration is the preferred one because of self-administration and patient acceptability. During the chewing process, the drug in the gum product is released from the mass into saliva and absorbed through the oral mucosa or swallowed reaching the stomach for gastrointestinal absorption. Mostly the residue (gum crude) that remains after chewing is spit out once the drug is released. Chewing gum provides new competitive advantages over conventional drug delivery systems: • Rapid onset of action • High bioavailability • Pleasant taste • Higher patient compliance (easy and discreet administration without water) • Instant use • High acceptance by children • Less side effects • Can be spilled out in the case of any adverse drug reaction is noticed. In this work,

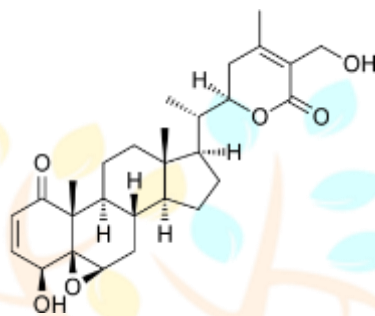
Ondansetron, Ashwagandha, and Caffeine are used to prepare chewing gum. It is used as an anti-emetic and anti-stress agent to inhibit motion sickness and stress during traveling.

HERBAL DRUG PROFILE

1. ASHWAGANDHA

It is commonly known as “**Indian Winter cherry**” or “**Indian Ginseng**”. It is one of the most important herb of Ayurveda (the traditional system of medicine in India) used for millennia as a Rasayana for its wide ranging health benefits. Ashwagandha is an evergreen shrub that grows in Asia and Africa. It is commonly used for stress. **Botanical source**—*Withania Somnifera* **Family**-Solanaceae

Chemical constituents- The major chemical constituents of *W. Somnifera* are withanolides, a group of naturally occurring C28 steroidal lactones with ergostane- based skeleton.



Ashwagandha contains chemicals that might help calm the brain, reduce swelling, lower pressure, and alter the immune system. Since ashwagandha is traditionally used as an adaptogen, it is used for many conditions related to stress. Adaptogens are believed to help the body resist physical and mental stress. Some of the conditions it is used for include insomnia, aging, anxiety and many others, but there is no good scientific evidence to support most of these uses. There is also no good evidence to support using ashwagandha for COVID-19. Ashwagandha is commonly available as a churna, a fine sieved powder. It enhances the function of the brain and nervous system and improves the memory. Maximum benefit appears when fresh Ashwagandha powder is used. The leaves are bitter and are recommended in fever, painful swellings.

EXCIPIENT PROFILE

2. Mastic gum

Mastic gum is a resin, or sap-like substance, that comes from the mastic tree. The mastic tree is an evergreen shrub that grows on the Greek island of Chios. A person can chew mastic gum like normal chewing gum, or they can ingest it in capsule or powder form. Essential oil from mastic gum is also available. People have used mastic gum for its medicinal properties for centuries.

3. Beeswax

Beeswax is a product made from the honeycomb of the honeybee and other bees. The mixing of pollen oils into honeycomb wax turns the white wax into a yellow or brown color. Beeswax is a common ingredient of natural chewing gum. In foods and beverages, white beeswax and beeswax absolute (yellow beeswax treated with alcohol) are used as stiffening agents. In manufacturing, yellow and white beeswax are used as thickeners, emulsifiers, and as stiffening agents in cosmetics.

Soy lecithin

It's one of the most widely used food additives on the market today. Soy lecithin is used as a softening agent in chewing gum. Soy lecithin is widely found in both conventional and health food stores. It's often used as an ingredient in food products and is sold in supplement form to boost your health. It is usually used as a liquid but can also be purchased as lecithin granules.

4. Saccharin

Saccharin is one of the oldest artificial sweeteners on the market. Infact, it has been used to sweeten foods and drinks for over 100 years. However, it wasn't until the '60s and '70s that it became popular as a sugar replacement. Some say that replacing sugar with saccharin benefits weight loss, diabetes, and dental health. It's around 300–400 times sweeter than regular sugar, so you only need a small amount to get a sweet taste. Saccharin is one of the most affordable low-calorie sweeteners available. It's popular as a zero-calorie substitute for sugar in cooking. It's also used as a sweetener in low-calorie processed foods such as fruit juices, candies, jams, jellies, and cookies.

5. Menthol crystals

Menthol Crystal, also known as Methylated Crystals are colourless mint-flavoured hexagonal crystals that are made from natural, *Mentha Arvensis* and peppermint. Menthol crystals have been a vital component of medical practices since ancient times. Its strong odour makes it a primary ingredient of pharma products formulated to cure ailments like congestion, cough, dry throat, etc. A medicinal product containing menthol manages to control plague or kills bacteria and alleviates skin problems. Its minty fragrance provides relief from bad breath. Menthol is widely used as a flavour enhancer. Chewing gum and mint flavoured confectionary all rely on the menthol cooling effect to give that refreshing feeling.

6. Citric acid

Citric acid is found naturally in citrus fruits, especially lemons and limes. It's what gives them their tart, sour taste. A manufactured form of citric acid is commonly used as an additive in food, cleaning agents, and nutritional supplements. Citric acid serves the food and beverage industry as a preservative. The naturally occurring acid found in fruit such as lemons and limes functions as a

preservative in its organic state. Its high acidity makes it difficult for mold, bacteria, or any negatively impacting substance to survive. Citric acid is deemed to be one of the most common preservatives and helps keep thousands of items fresh. It's in very high demand each year.

METHODOLOGY

API • Ondansetron: -It was gifted by SPICA LABORATORIES PVT LTD. Ahmedabad, India. • Ashwagandha: -It was purchased from chemdyes chemicals Gujarat India. • Caffeine: it was provided by the institute. EXCEPIENTS • Saccharin, Citric acid: - It was provided by the institute. • Mastic gum, Yellow Beeswax, Soy Lecithin, and Menthol Crystals were purchased from Chemdyes Chemicals, Gujarat India.

Fusion technique

Gum Base Preparation: - The first step of the process for formulating is to melt and soften the gum base at about 60 ° C temperatures until it becomes soft. The gum base contains mastic gum, beeswax, and soy lecithin. After softening the gum bases, other ingredients were added at a suitable time with a constant temperature.

Chewing Gum Preparation: - At first, the active substance powder (Ondansetron, caffeine, Ashwagandha) was triturated separately and added to the gum base mixture one after every 1.5 minutes at 40°C and mixed thoroughly. Then, a desired amount of Saccharin was added and mixed thoroughly until a uniform mixture was achieved. At the end of preparation, the temperature of the mixture was set below 40°C and the flavor was added gradually and mixed. When mixing was completed, the gum was placed on a Butter Paper, and then formatted into small bars with proper thickness and dimension. These gum bars were placed at room temperature and packed.

Ingredients	Amount	Functions
Gum base (Mastic gum, Bees wax)	50%-60%	Provide elasticity, flexibility, and controlgummy texture
Softening agent(Soy lecithin)	5%-10%	Soften the mixtureBetter mouth feel during chewing
Sweetening agent(Saccharin)	15%-30%	Retains moistureImprove taste
Flavouring agent (Menthol crystals)	0.1%-1%	Improves the flavour Taste masking effects Prevents bad breath
Antioxidant(citric acid)	0.02%	Protect gum base and flavors from oxidation
Active compounds (Ondansetron, Ashwagandha, Caffeine)	0.5%-30%	Specific function

Table 1. Composition and function of chewing gum ingredients.

Ingredients	F1	F2	F3	F4	F5
Mastic Gum	1gm	1.5gm	2gm	2gm	2gm
Beeswax Yellow	0.40gm	0.50gm	0.70gm	0.90gm	1.0gm
Soy Lecithin	0.40gm	0.40gm	0.20gm	0.15gm	0.15gm
Ondansetron	0.20mg	0.20mg	0.20mg	0.20mg	0.20mg
Caffeine	20mg	20mg	20mg	20mg	20mg
Ashwagandha	200mg	200mg	200mg	200mg	200mg
Menthol Crystals	5mg	5mg	5mg	5mg	5mg
Citric Acid	0.05mg	0.05mg	0.05	0.05mg	0.05mg
Saccharin	500mg	500mg	500mg	500mg	500mg

Table 2. Formulation of Medicated Chewing Gum by changing the concentration of gum base

EVALUATION PARAMETRES

Medicated chewing gum was evaluated by performing following tests.

✓ *Physical Appearance*

All the batches were visually evaluated for physical appearance, colour, odour, and size.

- Colour: It is dark yellow in colour.
- Size: It is about 1cm in size.
- Flavour: It is Mint flavoured chewing gum.
- Odour: Pleasant odour

✓ *Elasticity Study*

Elasticity of chewing gum is one of the important parameters. Appropriate elasticity of chewing gum contributes to increase the patient compliance as well as the proper release of the drug. It was determined by comparing the gum with the other marketed chewing gums.

✓ *Chewing Study of Gum Formulation*

The chewing gum should provide the good mouth feel and comfort during chewing without sticking to the teeth. However, the amount of saliva secreted contributes mainly in chewing the formulation. Three male and three female volunteers were asked to chew the placebo chewing gums (without drug) F1 to F5 for 1 min without swallowing saliva. The outcome of the chewing process provided by volunteers was categorized accordingly as good, bad, and sticky.

✓ *Texture Feel Study*

The texture study was performed manually by pressing the gum between the thumb and the finger. The texture feel was characterized into sticky, good, or solid mass.

✓ *Stability Study*

Stability study of chewing gum was studied to obtain a stable product which assures safety and efficacy, till shelf life, at defined storage and package conditions. Stability study was done by storing the prepared medicated chewing at room temperature and observing daily.

✓ *The melting point of gum base*

It was determined by melting the chewing gum to know the temperature which the base loose out its texture and behave as a liquid.

✓ *Weight/Mass variation*

Weight variation of all formulation was done by method described in experimental work. Weight of 4 chewing was taken in one batch, and then average weight is calculated.

✓ *Stickiness*

Medicated chewing gum was placed on a surface; 250gm of cylindrical hammer collide on to it for period of ten minutes. The frequency of hammering was about 30 per minute. After 10 minutes, sticking of mass to hammered surface was observed and reported

IV. RESULTS AND DISCUSSION

As a proportion of mastic gum was increased, an increase in hardness of the chewing gum was observed. Soy lecithin and Beeswax were added in appropriate proportion for better texture feel. At 60% and 70% gum base composition homogeneous mass was obtained, and the prepared chewing gums exhibited good elasticity with good texture.

	F1	F2	F3	F4	F5
Mastic Gum	1gm	1.5gm	2gm	2gm	2gm
Beeswax Yellow	0.40gm	0.50gm	0.70gm	0.90gm	1.0gm
Soy Lecithin	0.40gm	0.40gm	0.20gm	0.15gm	0.15gm
Adhering to teeth	Yes	Yes	Yes	No	No
Chewability	Very poor	Very poor	Passable	Good	Very good
Texture feel	Sticky	Sticky	Less sticky	good	Very good
Melting point	35°	45°	55°	60°	70°

Table 3. Evaluation of different formulation of gum base results

VI. CONCLUSION

We prepared allopathy-herbal medicated chewing gum using ondansetron, ashwagandha, and caffeine as the main active ingredients by the Fusion technique using chewing gum as a carrier. According to our findings, F4 and F5 gums were the best formulations in terms of organoleptic characteristics. The best flavoring agents and sweeteners for these gums that could modify the bitter taste of caffeine, ashwagandha, and ondansetron were mentha flavor and saccharin sweetener.

Thus, it was concluded that the medicated chewing gum of ondansetron, ashwagandha, and caffeine can be well formulated. It can give a faster onset of action and easy administration, anywhere and anytime, without access to water to the person having a problem of motion sickness and stress during traveling.

VII. REFERENCES

- Thivya, P., Durgadevi, M. and Sinija, V.R.N., 2021. Biodegradable medicated chewing gum: A modernized system for delivering bioactive compounds. *Future Foods*, 4, p.100054.
- Aslani, A. and Jalilian, F., 2013. Design, formulation, and evaluation of caffeine chewing gum. *Advanced biomedical research*, 2(1), p.72.
- Aslani, A. and Rafiei, S., 2012. Design, formulation, and evaluation of nicotine chewing gum. *Advanced biomedical research*, 1(1), p.57.
- Paradkar, M., Gajra, B. and Patel, B., 2016. Formulation development and evaluation of medicated chewing gum of anti-emetic drug. *Saudi Pharmaceutical Journal*, 24(2), pp.153-164.
- Shete, R.B., Muniswamy, V.J., Pandit, A.P. and Khandelwal, K.R., 2015. Formulation of eco-friendly medicated chewing gum to prevent motion sickness. *AAPS PharmSciTech*, 16(5), pp.1041-1050.
- Graudins, L.V., 2009. Preventing motion sickness in children. *Australian Prescriber*, 32(3).
- Al-Said, M.S., Ageel, A.M., Parmar, N.S. and Tariq, M., 1986. Evaluation of mastic, a crude drug obtained from *Pistacia lentiscus* for gastric and duodenal anti-ulcer activity. *Journal of Ethnopharmacology*, 15(3), pp.271-278.
- Athanikar, N.K. and Gubler, S.A., Josman Laboratories Inc and Deseret Laboratories Inc, 2001. *Process for manufacturing a pharmaceutical chewing gum*. U.S. Patent 6,322,828.
- Mehta, F.F., Rajagopalan, R. and Trivedi, P., 2017. Formulation and characterization of caffeine biodegradable chewing gum delivery system for alertness using plasticized poly (D, L-lactic acid) as gum base. *Tropical Journal of Pharmaceutical Research*, 16(7), pp.1489-1496.
- Mochizuki, K. and Yokomichi, F., Meiji Seika Kaisha Ltd, 1976. *Process for the preparation of chewing gum*. U.S. Patent 4,000,321.
- NGN, S., Shilpa, P. and Abbas, Z., 2012. Article Details Formulation and Characterization of Medicated Chewing Gums of Dextromethorphan Hydrobromide.



Fig-1: Ondansetron

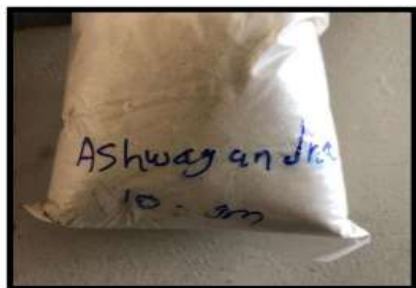


Fig-2: Ashwagandha



Fig-3: Caffeine



Fig-4: Saccharin



Fig-5: Soy Lecithin



Fig-6: Citric Acid



Fig-7: Menthol Crystals



Fig-8: Mastic Gum



Fig-9: Yellow Beeswax





Fig-10: F1 Formulation



Fig-11: F2 Formulation



Fig-12: F3 Formulation



Fig-13: F4 Formulation



Fig-14: F5 Formulation

