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Design Formulation and Evaluation of Ginger Medicated Herbal Chewing Gum

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Abstract: *A herbal medicated chewing gum was developed as a novel delivery system for antifungal treatment of oral candidiasis, incorporating ginger extract and peppermint. The gum was prepared using acacia gum base, sweeteners, binders, and flavouring agents, then moulded into chewable pieces. It was evaluated for organoleptic and physicochemical properties including colour, odour, taste, texture, weight variation, size, pH, and moisture loss. The gum showed uniform size and weight, a white rough-coated appearance, pleasant peppermint aroma, and spicy-sweet taste. It maintained good stability and acceptable pH throughout, supporting its potential as a convenient and effective oral antifungal dosage form.*

Keywords: chewing gum

I. INTRODUCTION

To produce a systemic or original pharmacological effect, specifics are generally manufactured in a range of lozenge forms, similar as tablets, capsules, injections, inhalers, and ointments, among others. Because oral drug distribution is easier to use than other cure forms, it's the most extensively accepted system of medicine administration. Biting goo has a confectionary part, but now days, because it absorbs substances snappily through the mouth depression, it also demonstrates the topmost and most accessible drug delivery technology(01).

Since ancient, humans discovered how pleasurable it was to bite a variety of substances. Biting goo has been used each across the world. A thousand times agone the Mayan Indians masticated tree resin from the sapodilla tree to clean their teeth and refreshen their breath(02).

Compared to tablets, capsules, or liquids, parents are more willing to allow their kiddies use biting goo that's treated with sauces. Biting goo with drug is used to administer drug either locally or overall. For oral remedy, the medicine may be released locally or snappily absorbed by the oral mucosa for systemic conditions, performing in a quick launch of action and high bioavailability. This prevents both gastrointestinal tract metabolism and first- pass metabolism (03).

In comparison to capsules and bathos, herbal treated chewing goo is a more favored drug delivery strategy due to its wide use and capacity to release bioactive constituents in the mouth depression for a dragged quantum of time (04).

fresh case benefits like separate and accessible administration and the possibility of buccal immersion, which results in a prompt onset of action, are anticipated from a new medicine delivery system(05)

Biting goo is generally made up of a goo base a water- undoable phase as well as other factors. These include glucose, which acts as a humectant and fleeces the sugar patches to stabilize their suspense and keep the goo flexible, colourful mufflers, food colouring, preservatives, seasonings, etc., the volume and size of the powdered sugar determines how brittle the final goo will be. Once a tradition biting goo has been masticated for the necessary quantum of time to deliver the cure, the residual bulk needs to be thrown down (06). The forestalment of dental caries, periodontal diseases, and halitosis remains a major challenge in ultramodern culture, despite the fact that oral health is an essential element of general well- being. Indeed while brushing and flossing are good oral hygiene habits, there's a growing need for reciprocal and indispensable styles that have farther advantages. In the field of oral healthcare products, the use of natural, bioactive substances produced from shops has attracted a lot of attention (07).

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[Fig. No. 1]

Key characteristics and attributes of herbal medicinal chewing gum [8,9,10]

i. It must be soft and chewable.
ii. It must have the right amount of flexibility.
iii. The bases of chewing gum should not be harmful.
iv. It must be packaged for ease of usage and portability.
v. The flavour ought to be palatable and long-lasting.

Why Ginger is used in chewing gum

Ginger is a well-known and historically utilized plant that is extensively used for a variety of reasons in science, medicine, culinary, and grocery stores. Value and profit have been demonstrated in a variety of studies, tests, and publications[11,12] Since herbal therapy is so popular these days, ginger has gained a significant and unique role in people's lives. Some of its advantages are Motion sickness prevention, particularly seasickness prevention and nausea following chemotherapy[13,14] Ginger helps prevent colon mucosal damage from inflammatory bowel disease and colitis, as well as duodenal ulcers.[15,16,17] The main part of gusto used in drug or as a spice is the glandular and decumbent rhizomes of Zingiber officinale Roscoe, The gusto family - Zingiberene consists of some species which utmost have sweet and racy parcels. The tropical home of gusto is Asia, especially India and southeastern countries. Over 4000 times gusto was used as a spice in cooking and as a home - remedy for some GI torture symptoms, digestive diseases, and during gestation. In India, gusto plays a introductory part in their cookery.[11,18,19]

[Fig. No. 2]

Apply chewing gum as a Chewing gum can be used as a drug delivery method.

Compared to traditional medication administration methods, chewing gum offers new competitive advantages:

a) High bioavailability and quick onset of action.

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b) A pleasant flavor.
Increased adherence (smooth and discrete waterless administration).
c) All set to go.
d) Children's high acceptance

Fewer Side Effects : Because hepatic first pass metabolism is prevented, low dose results in great efficiency. Controlling the release rate also lowers the possibility of adverse consequences. Avoiding a high plasma peak concentration

Systemic Effect : When saliva is ingested, active ingredients may enter the body through the GI tract or the buccal mucosa. as soon as the blood contains the active ingredient. It is possible to achieve systemic effects.

Fast Onset of Action : Fast start of systemic action is noted for active compounds ab sorbed through the buccal mucosa. As the active ingredient moves through straight through the systemic circulation by the jugular veins.

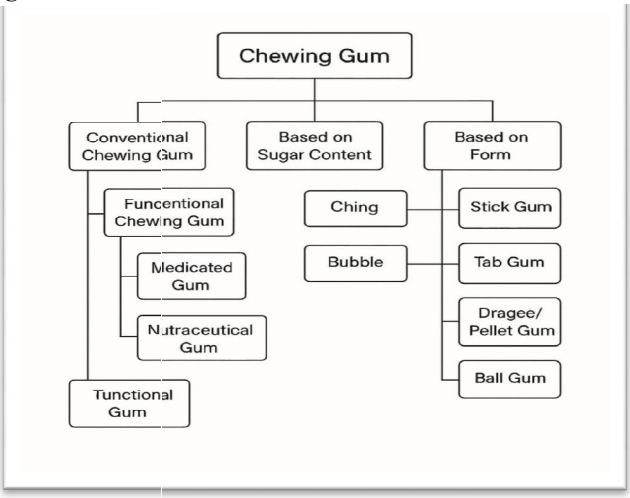
Effect on Dry Mouth : Many medications (antidepressants) cause dry mouth as a side effect, and it is also a symptom of a number of illnesses (such as Sjogren's syndrome, an autoimmune condition marked by lymphocytic infiltration of the salivary and lachrymal glands).

By encouraging the production of saliva, chewing gum helps to reduce oral dryness.

Chewing Time and Chewing Rate : It should take 20 to 30 minutes. The drug release is also influenced by the chewing speed. About 60 chews per minute is the usual chewing pace**.**

Contact Time : The duration of the chewing gum's contact with the mouth cavity determines both the local and systemic effects. A 30-minute chewing period was deemed nearly normal in the research investigation.[20]

Classification of chewing gum



[Fig. No. 3]

Types of Chewing Gum

Chewing gum is available in a wide range of flavours, sizes, and forms.

Gum comes in a variety of forms, although it is often a little stick or wad. In essence, chewing gum is created by mixing a water-soluble phase of food colouring, flavouring, and sweeteners with a water-insoluble phase. A variety of chewing gum varieties are made with dental hygiene in mind. Gums are used to clean teeth, whiten teeth, and provide fresh breath (Figures 1, 2). Mint, spearmint, peppermint, wintergreen, cinnamon, licorice, sour apple, cherry, grape, orange, watermelon, strawberry, lemon, and blueberry are the most often consumed tastes.[21]

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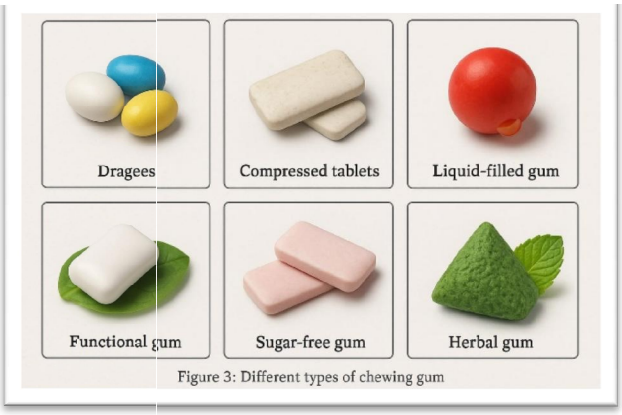

Figure 3: Different types of chewing gum

[Fig. No. 4]

Advantages

1. Digestive Aid: Ginger stimulates saliva and digestive enzymes, potentially aiding digestion when chewed.
2. Anti-inflammatory Properties: Ginger contains compounds like gingerol that may help reduce inflammation in the mouth and throat.
3. Anti-nausea Effect: Chewing ginger gum may help reduce nausea and motion sickness.
4. Oral Health Benefits: Ginger has antimicrobial properties that may help reduce bacteria in the mouth and improve breath.
5. Natural Flavouring: Provides a spicy, refreshing flavour that can be a unique alternative to mint-based gums.

Health Benefits of Biting Goo :-

a) Biting goo improves memory
b) Biting goo reduces symptoms of stress.
c) Biting goo helps to manage weight
d) Biting goo improves digestion.
e) Biting goo improves oral health.
f) Biting goo improves oral Hygiene and help oral bad smell.

Disadvantages :

1. Strong Taste: The pungent and spicy taste may not be appealing to everyone.
2. Possible Allergic Reactions: Some individuals may be sensitive or allergic to ginger.
3. Interactions with Medications: Ginger can interact with blood thinners and diabetes medications.
4. Stability Issues: Ginger's active compounds may degrade over time, affecting the gum's shelf life or effectiveness.
5. Cost: Natural ginger extracts may be more expensive than synthetic flavoring agents.[22]

Materials :-

1] Gum Base :

Gum base is the insoluble, chewable part of chewing gum that stays in your mouth while the other components (like sugar or sweeteners and flavorings) dissolve. It provides the texture, chewiness, and elasticity that characterize gum**.**

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1 Acasia gum base:

[Fig No 4]

Common Name: Gum Arabic babul
Scientific Name:Vachellia nilotica
Family: Fabaceae
Parts Used: Gum
Role: t's a natural, soluble fibre used in food and beverages as a stabilizer, emulsifier, and thickener

Active Pharmaceutical Ingredient

The glandular and decumbent rhizomes of Zingiber officinale Roscoe are the primary component of ginger used in medicine or as a spice. The ginger family, Zingiberene, includes a few species, the majority of which have aromatic and spicy qualities.[23,24]

[Fig No 5]

Commen Name: Gnger
Scientific Name:Zingiber officinale
Family: Zingiberaceae,
Role : motion sickness, and chemotherapy.

Honey:

Dextrose and laevulose (70–80%) and water (14–20%) make up the majority of honey. includes volatile oil, pollen grains, enzymes, vitamins, amino acids, proteins, coloring materials, sucrose (1.2–4.5), dextrin (0.06–1.25%), and other substances. Honey has several uses, including as a sweetener, antiseptic, bactericidal, demulcent, mild laxative, and an essential ingredient in cough and lincus mixtures.[25]

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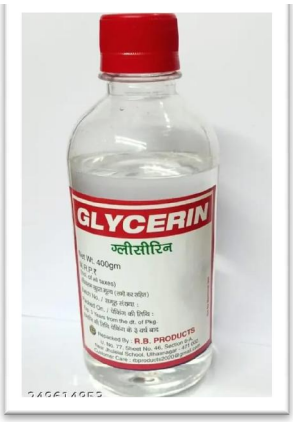
[Fig No 6]

Commen Name : Madhu, Madh,
Family: Apidae
Role : Antibacterial and antiseptic
Uses: Natural sweetener

Glycerine :

Glycerine is a versatile substance with numerous applications, primarily acting as a humectant to draw and retain moisture.



[Fig No 7]

Peppermint :

Peppermint is used in medicine mainly for its soothing effects. It helps relieve digestive issues like bloating, gas, and indigestion. The menthol in peppermint can ease headaches, muscle pain, and cold symptoms. Peppermint oil is also used in irritable bowel syndrome (IBS) treatment.

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[Fig No 8]

Mannitol :

mannitol is used as texturizer. Gives structure and volume to the gum. As a filler

[Fig No 9]

Hydroxypropyl Methylcellulose :

HPMC helps in binding the active pharmaceutical ingredient (API) and excipients together within the gum base, maintaining uniformity and integrity during HPMC helps in binding the active pharmaceutical ingredient (API) and excipients together within the gum base, maintaining uniformity and integrity during processing and storage. Ural colouring processing and storage.

Beet root :

beet root used in chewing gum as a natural colour agent to improve colour stability

[Fig No 10]

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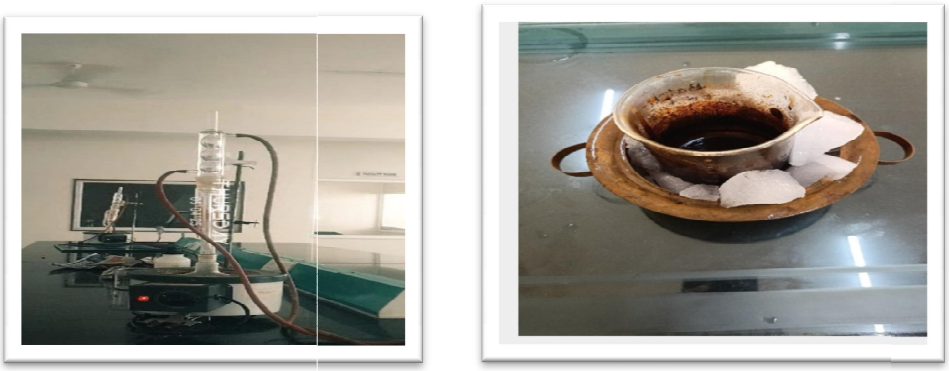
II. METHDOLOGY

Acasia gum, Ginger Extract, Honey Glycerin,Peppermint,Manitol Hydroxypropyl Methylcellulose Titanium Dioxide, Citric Acid, Beet Root for Preparation of Herbal Medicated Chewing Gum

Sr No	Ingredients	Quantity For100g batch	Role
1	Acacia	30g	Emulsifying agent
2	Ginger extract	10g	Anti- Inflammatory
3	Honey	14.1ml	Antibacterial and antiseptic
4	Glycerine	5ml	Humactant
5	Peppermint	2g	Flavouring agent
6	Mannitol	15g	Filler
7	Hydroxypropyl Methyl cellulose [HPMC]	5g	Binding agent
8	Titanium Dioxide	2g	Opacifier
9	Citric acid	1g	Preservative and Antioxidant
10	Beet root	Q.S	Colouring Agent

Table No.1. Ingredient of herbal medicated chewing gum with Quantity

EXTRACTION METHOD OF GINGER EXTRACT :



[Fig No 11]

Method Of Preparation :

1. Accurately weigh all the dry ingredients (herbal extract, sweetener, filler, binder, and coating agent). Mix them uniformly in a blender.

↓

2. Addition of Gum Base Heat the gum base slightly (~50-60°C) to soften it. Incorporate it into the dry mix while stirring continuously.

↓

3. Incorporation of Liquid Components Add glycerin (softener) and mix well to ensure uniform distribution.Introduce the flavouring agent and colorant, if needed.

↓

4. After pouring the bulk into the Mold, it was left to cool at ambient temperature. The gum fragments were taken out

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[Fig No 12]

EVALUATION OF HARBAL MEDICATED CHEWING GUM

The prepared herbal medicated chewing gum was evaluated for its various parameters such as organoleptic evaluation, physicochemical evaluation .

ORGANOLEPTIC EVALUATION :-

Organoleptic properties for several sensory aspects, such as colour, aroma, and taste, were carefully noted down as illustrated. Separate analyses of the organoleptic

Colour :-

The prepared herbal medicated chewing gum was evaluated for its colour. The colour was checked visually by naked eye.

Odour:-

Odour was checked by smelling the product

Taste:-

Taste was manually checked by tasting the product.

Texture:-

Texture was evaluated in relation to product quality

Appearance:-

The appearance was visually evaluated

PHYSICO- CHEMICAL EVALUATION:-

1] Determination of consistence dimension :

The mean consistence was determined for each set sticky by using a digital venire caliper

[Fig No 13]

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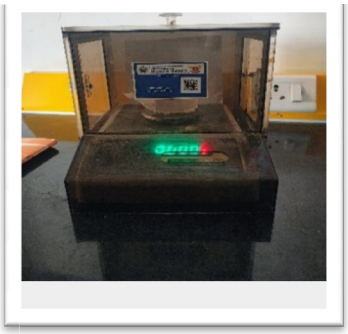
2] Determination of weight variation :

The weight of each set sticky was determined by using a digital electrical balance followed by calculating the mean and the standard divagation for each sticky



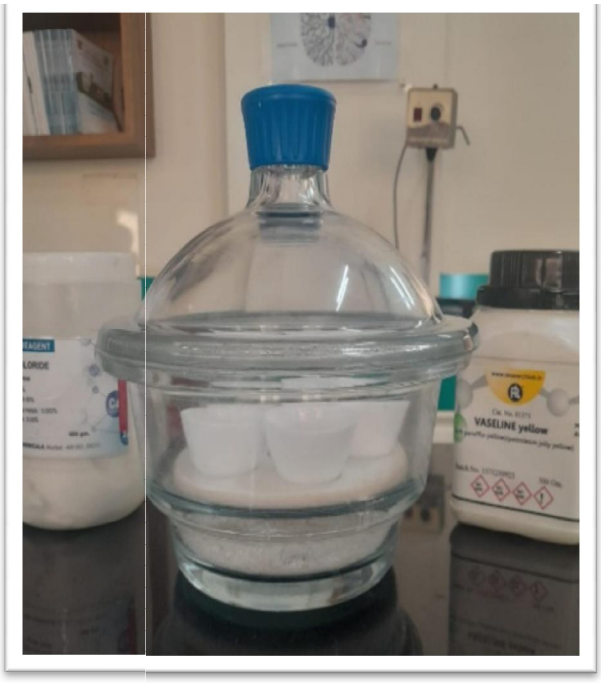
[Fig No 14]

3] DETERMINATION OF HUMIDITY LOSS AND HUMIDITY CONTENT

Each sticky was ladened and put in a desiccator containing about 1- g of anhydrous cacl2 for three days, after that it was removed from the desiccator andre-weight again. The Chance humidity loss and humidity content were determined by using the following equation

Chance humidity loss = original weight – final weight/ original weight eq 1

Chance humidity content = original weight – final weight eq 2



[Desiccator Apparatus]

[Fig No 15]

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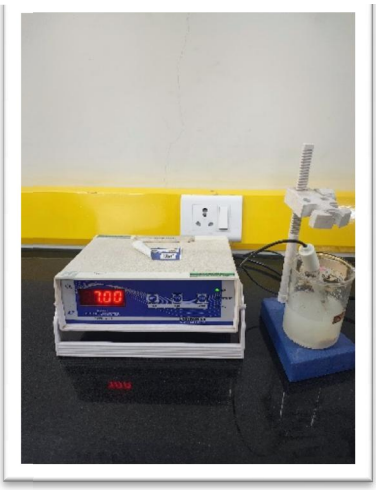
4] face pH-

This test is done by cutting the goo into four pieces and putting them in 50 ml DW following recording the pH by digital pH cadence after 10 twinkle



[Degital Ph]
[Fig No 16]

5] Stickyness :

The formulated herbal chewing was placed on plane surface and a mass of 250 gm was hammered on it for 10 mins. After 10 mins, the sticking of mass to hammered surface was observe

[Fig No 17]

III. RESULT AND CONCLUSION

Evaluation of herbal medicated chewing gum

The prepared herbal medicated chewing gum was subjected to under mentioned evaluation.

ORANOLEPTIC EVALUATION

Distinct parameters were studied such as: Colour, Odour, Taste, Texture and Appearance.

Colour – the colour of the formulated and evaluated herbal medicated chewing gum is shown white colour.

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Odour – the formulated medicated chewing gum is aromatic because in the study prepared using peppermint powder which act as a flavouring and freshening agents

Taste- the prepared herbal medicated chewing gum is sweet and spicy taste as the ginger extract is been used so its tastes spicy.

Texture – the texture of the herbal medicated chewing gum is smooth.

Appearance – Appearance of the product is rough textured, uniformly coated mass.

Parameters	Result
Colour	White
Odour	aromatic
Taste	spicy
Texture	rough
Appearance	Rough texture, uniformly coated

Table no. 2 organoleptic properties

PHYSICO-CHEMICAL RESULT:

Determination of weight variation :

Sample no	**Weight of sample**
1	2.53 gm
2	2.34 gm
3	2.30 gm
4	2.71 gm
5	2.44 gm
6	2.68 gm

[Table no. 3. Weight Variation]

$$\frac{sum\ of\ individual\ weight}{No\ of\ sample}\ \frac{15}{6} = 2.5$$

DETERMINATION OF CONSISTANCY AND DIMENSIONS :

No. of sample	**Length of sample**	**width**
1	1.9 cm	1.4cm
2	1.6cm	1.0cm
3	1.6 cm	1.0cm
4	1.9 cm	1.6cm
5	1.9cm	1.6cm
6	1.9cm	1.6cm

[Table no. 4. consistence dimension]

Determination of humidity loss and humidity content

Initial Weight of sample	**Weight of gum after 3 days in desicator**
2.53	2.3 gm
2.34	2.3 gm
2.30	2.6 gm
2.71	2.5 gm
2.44	2.4 gm

[Table no .5. humidity content and humidity loss

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pH Test :

It is tested 10 times so the result we got is given

Time taken	pH
1	3.1
2	3.22
3	2.94
4	3.11
5	3.54
6	3.82
7	3.78
8	4.76
9	7
10	5.70

[Table no.6. pH]

IV. CONCLUSION

The developed herbal chewing gum formulation was successful, yielding a palatable product with a pleasant peppermint aroma and a sweet, spicy ginger taste. Organoleptic testing confirmed the gum was white with an aromatic odor and spicy flavor, a smooth chew texture, and a rough, uniformly coated appearance. Physicochemical assessments showed the gum had effective consistency and stability: sample pieces were uniform in size (approximately 1.6–1.9 cm by 1.0–1.6 cm) and weight (mean ~2.5 g with minimal variation). Moisture studies indicated only minor weight loss over time (good humidity stability), and the pH remained in an acceptable (slightly acidic to neutral) range, reflecting product stability. These findings demonstrate that the ginger–peppermint medicated gum has a robust consistency and stable profile. In summary, the herbal gum shows promise as a stable, patient-friendly oral drug delivery system with enhanced flavour and acceptable physical characteristics, suggesting its potential as an alternative therapy for oral fungal infections. Further testing (including clinical efficacy) would be warranted to confirm its antifungal effectiveness**.**

REFFERENCES

[1]. S V Lakshmi, H KS Yadav, K P Mahesh, S Uniyal, A Ayaz, et al. (2014) Nagavarma, Formulation and evaluation of medicated chewing gum as antiplaque and antibacterial agent 6(4): 3-10.

[2]. Shete R. B., Muniswamy V. J., Pandit A. P., Khandelwal K. R.2015,"Formulation of Eco friendly Medicated Chewing Gum to prevent motion sickness". AAPS Pharm Sci Tech; https://doi.org/10.1208/s12249-015-0296-y.

[3]. Kumar R., Solanki P. and Chandra A.2014,"Medicated Chewing Gum- A novel drug delivery system: An updated review". American Journal of Advanced Drug Delivery; ISSN 2321 547X.

[4]. Anand S. et al (2009) Chewing gum: a friendly oral mucosal drug delivery systemVolume 4, Issue 2, September – October 2010; Article 012 ISSN 0976 – 044X.

[5]. Farhad Mehta, et al (2007) Formulation And Characterization Of Natural Biodegradable Chewing Gum International Journal of Pharm Tech Research

[6]. Basani Gavaskar1 et al (2000) Medicated Chewing Gum – A Novel Approach to improve Patient Compliance International Journal of Research in Pharmaceutical and Biomedical Sciences.

[7]. 7. Sabera Khatun, et al (2011) Medicated chewing gum: An unconventional drug delivery system International Current Pharmaceutical Journal.

[8]. Jain N., Jadhav M., Annigeri RG. and Pipaliya PR. Medicated Chewing Gums - A Novel Targeted Drug Delivery. Journal of Indian Academy of Oral Medicine & Radiology. 2019. 31:62-65.

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[9]. 11. Aslani A. and Jalilian F. Design, Formulation and Evaluation of Caffeine Chewing Gum. Adv. Biomed. Res. 2013. 2 (3): 1- 11.

[10]. Pathan AK., Panse G. and Mishra A. Formulation and Evaluation of Ondensetron HCL chewing gum by compression method. IJRTSAT. 2018. Special Issue. ACAEE: 484- 487.

[11]. Benzie IF, Wachtel-Galor S, Bode AM, Dong Z. The amazing and mighty ginger. Ch. 7. 2nd ed; New York, CRC press, 2011.

[12]. Altman RD, Marcussen KC. Effects of a ginger extract on knee pain in patients with osteoarthritis. Arthritis Rheum 2001;44:2531-8

[13]. Lien HC, Sun WM, Chen YH, Kim H, Hasler W, Owyang C. Effects of ginger on motion sickness and gastric slow-wave dysrhythmias induced by circular vection. Am J Physiol Gastrointest Liver Physiol 2003;284:481-9.

[14]. Ernst E, Pittler MH. Efficacy of ginger for nausea and vomiting: A systematic review of randomized clinical trials. Br J Anaesth 2000;84:367-71.

[15]. Minaiyan M, Ghannadi A, Karimzadeh A. Anti-ulcerogenic effect of ginger (rhizome of Zingiber officinale Roscoe) on cystemine induced duodenal ulcer in rats. Daru J Pharm Sci 2006;14:97-101.

[16]. Rashidian A, Mehrzadi S, Ghannadi AR, Mahzooni P, Sadr S, Minaiyan M. Protective effect of ginger volatile oil against acetic acid-induced colitis in rats: A light microscopic evaluation. J Integr Med 2014;12:115-20.

[17]. Chrubasik S, Pittler MH, Roufogalis BD. Zingiberis rhizoma: A comprehensive review on the ginger effect and efficacy profiles. Phytomedicine 2005;12:684-701.

[18]. Ali BH, Blunden G, Tanira MO, Nemmar A. Some phytochemical, pharmacological and toxicological properties of ginger (Zingiber officinale Roscoe): A review of recent research. Food Chem Toxicol 2008;46:409-20.

[19]. Kaul PN, Joshi BS. Alternative medicine: Herbal drugs and their critical appraisal – Part II. Prog Drug Res 2001;57:1-75

[20]. PK Pagare, CS Satpute, VM Jadhav, V Kadam (2012) Medicated chewing gum: A novel drug delivery system. journal of applied pharmaceutical science 2(6): 40-54.

[21]. Vasudha Lakshmi S, Hemant K S Yadav, Mahesh KP, Abhay Raizaday, Navya Manne, et al. (2014) Medicated chewing gum: An overview.

[22]. Pagare PK, Satpute CS, Jadhav VM, Kadam V (2012) Medicated chewing gum: A novel drug delivery system. Journal of applied pharmaceutical science 2(7): 40-54.

[23]. Ali BH, Blunden G, Tanira MO, Nemmar A. Some phytochemical, pharmacological and toxicological properties of ginger (Zingiber officinale Roscoe): A review of recent research. Food Chem Toxicol 2008;46:409-20.

[24]. 18. Kaul PN, Joshi BS. Alternative medicine: Herbal drugs and their critical appraisal – Part II. Prog Drug Res 2001;57:1-75

[25]. P Patel (2011) medicates chewing gum: A review 1(1): 111-128.