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Formulation and Evaluation of Chewable Tablets of Pomegranate Peel Extract

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ABSTRACT

Nowadays, dental caries is one of major oral disease caused due to facultatively anaerobic, gram-positive *Streptococcus mutans*. Pomegranate peel powder extract is known to have activity against *Streptococcusmutans*. The ethanolic extract of pomegranate peel powder was tested against streptococcus mutans (MTCC 497t). The Minimum inhibitory concentrations was found to be 6.24 mg/ml. Chewable tablet containing 10x MIC of the pomegranate peel powder was tested by cup plate method for its antibacterial activity against Streptococcus mutans. The study concludes that pomegranate peel extract is a natural antibacterial source can be used in formulating chewable tablet which are better than chemical formulations specially mouth washes as stay-in-mouth time of these chewable tablet are extended ensuring good antibacterial activity with good organoleptic properties.

Keywords: Dental caries, Chewable tablet, Pomegranate peel, *Streptococcus mutans.*

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INTRODUCTION:

Dental caries is one of the major oral diseases caused primarily by *streptococcus mutans*.It is of great concern to dentists as it affects all age groups causing loss of tooth structure, moderate to severe pain, swelling and infection[1-2]. The organism, in presence of fermentable carbohydrates produces acid which induces demineralization of tooth structure. Dental caries have conventional treatment with antibiotics and Fluoride, Acetaminophen, Ibuprofen.Traditional medicine offers a good alternative to synthetic chemical substances,large number antibacterial compounds have been isolated from plant species. Natural ingredients such as clove oil, aloe vera, turmeric, sesame, cranberry, meswak, sesame, red clover are also used for the dental caries treatment.Pomegranate peels extract has been reported to exhibit high level of antibacterial activity[3-4]. The extract also hasother medicinal activities like antioxidant,antidiarrheal,antifungal[5-6].Chemical constitutents present in pomegranate are Punicalagin, gallic acid, ellagic acid, Punic acid .The objective of this study is to develop an effective formulation containing pomegranate peel extract and evaluation of invitro antibacterial activity[7-8]of the same,under accelerated storage conditions for 3 months

MATERIAL AND METHOD:

Plant Material and Extraction:

Pomegranates (*Punicagranatum*) were personally picked from farm. The sample was authenticated by Botanical Survey of India. The peel was manually removed, sun-dried and powdered. Powder was extracted with a Soxhlet extractor using ethanol for 36 hours[6]. Ethanolic extract thus prepared was then concentrated on electric water bath. Then semisolid (sticky) extract was obtained.

The material used for the preparation of tablets were:Xylitol (Research lab fine chem industries, Mumbai),Talc(Zimlaborateies, kalmeshwar, Nagpur), Lactose Monohydrate (LOBA Chemicals, Mumbai), Polyvinylpyrrolidone (ANA Lab fine chemicals, Mumbai), Mannitol (ANA Lab fine chemicals, Mumbai), Magnesium sterate (Loba chemicals, Mumbai)

Triple stability chamber (Make -Thermolab) was used for stability testing.

Formulation of Chewable Tablets of Pomegranate Peel extract:

Chewable tablets containingPomegranate peel extract were formulated as shown in table no.1

The extract was mixed with xylitol, mannitol, lactose and the powder so obtained was moistened with aqueous solution of PVP K 30. The material obtained was granulated through sieve number 18 and dried to constant weight at room temperature. The dried granules were passed through sieve

no 22 and mixed with required quantity of Magnesium Stearate and talc.

The granules were evaluated for angle of repose (funnel method), bulk density and Carr index using methods described in literature[9].

The tablets were compressed to weight of 450 mg using D tooling on Rimek tablet machine (make Karnavati) and evaluated for hardness, friability and uniformity of weight test[10].

Table no. 1 Trial Formula for chewable tablet

BATCHES NO.	F 1	F 2	F 3
INGREDIENTS	mg/tab	mg/tab	mg/tab
Extract of Pomegranate peel	150	150	150
Mannitol	50	50	50
Xylitol	100	90	80
Lactose	135	145	155
Magnesium Stearate	6	6	6
PVP K30	5	5	5
Talc	4	4	4
Water	q.s.	q.s.	q.s.
Total	450	450	450

Antimicrobial activity test:

Agar well diffusion method:

The antimicrobial activity of extract was determined by CUP-plate method in Brain Heart infusion Agar. The antibacterial activity was assayed against *Streptococcus mutans (*MTCC 497t) by CUP- plate method. The medium was inoculated with 10^6 cfu/ml of microorganism suspended in brain heart infusion broth . Once the brain heart infusion agar was solidified, Using Sterile T- borer wellwere made. Each well was filled with 25 µl solution of various concentration of the Extract (31.25 to 1000 µg/ml). DMSO was used as blank. The ethanolic extract of pomegranate peel powder were tested. After incubation at 37^0c ±1^0C for 48 hrs. the diameter of zone of inhibition (mm) surrounding each of the wells were recorded using Vernier caliper the method was proceed as per CLSI guideline[11].

Minimum inhibitory concentration (MIC) is the lowest concentration of an antimicrobial agent that inhibits the growth of microorganism after 18 -24 hrs.MIC was determined by zone of inhibition. The minimum concentration of the extracts that showed no detectable growth was taken as the minimum inhibitory concentration.

Accelerated stability testing:

Chewable tablets of pomegranate peel powder extract were packed in polythene bag and placed within amber coloured glass bottle at 40^0C / 75% RH. Tablets were analysedat 1 month interval for 3 months.

RESULT AND DISCUSSION:

Preparation of tablets:

In preparing chewable tablets from ethanolic extract of pomegranate peel powder,the wet granulation method was used. The ingredients of chewable tablet from pomegranate peel powder extract were indicated in Table no.1.Initially formula I and II were tried it was observed at granulation stage it become sticky, because the xylitol is hygroscopic[12]therefore it was decided to reduce the quantity of Xylitol and increase the quantity of lactose in formula F3, therefore formula 3 were used for the chewable tablet formulation.

Chewable tablets evaluated as per IPQC tests:

Pre-compression test as shown in table no: 2

Table no. 2 Pre-compression study

Sr.no.	Test	observation	conclusion
1	Angle of repose	25°	Excellent
2	Bulk density	0.6117	Excellent
3	Tapped density	0.6341	Excellent
4	Carr's index	3.174	Excellent
5	Hausner Ratio	1.034	Excellent

The tablets were evaluated for Physical appearance of the tablets were smooth,absence of crack,uniform. The chewable tablets were evaluated for various performance properties. The hardness test was performed to provide a measure of tablet strength by using Monsanto hardness tester. Tablet should be hard enough for packaging and shipping but not so hard as to create difficulty during chewing. The hardness was 7 (kg/cm^2). % friability of tablet was found be 0.47%.Postcompression test as shown in table no.3

Table no: 3 Post compression study

Sr. No.	Test	Observation
1	Average weight	450 (mg)
2	Thickness	3(mm)
3	Friability	0.47%
4	Hardness	7 kg/cm^2

In vitro Antibacterial activity against streptococcus mutans

The ethanolic extract of pomegranate peel powder and formulated chewable tablets were tested for antibacterial activity against *Streptococcus mutans*[13-15] (MTCC 497t) that was carried out by Agar diffusion method. The observed results are as shown in Fig. No.1.4 and Table no.4.

Ethanolic extract of pomegranate peel powder and its chewable tablet showed a significant antibacterial activity against *streptococussmutans (497t)*.MIC were determined by the 10x cup plate method by the CLSI guidelines with Brain heart infusion broth (oxoid/ Difco). Based on the observation, it would be concluded that chewable tablet of pomegranate peel extract contains constituents that are responsible for antibacterial activity.

Table no. 4. Herbal extract against *s.mutans*

Sr.no.	Concentration (µg/ml)	Conc. in well (mg)	Zone of inhibition (mm)
1	1000	25	34
2	500	12.5	28
3	250	6.25	28
4	125	3.12	20
5	62.5	1.56	17
6	31.25	0.8	0
7	DMSO	25	-

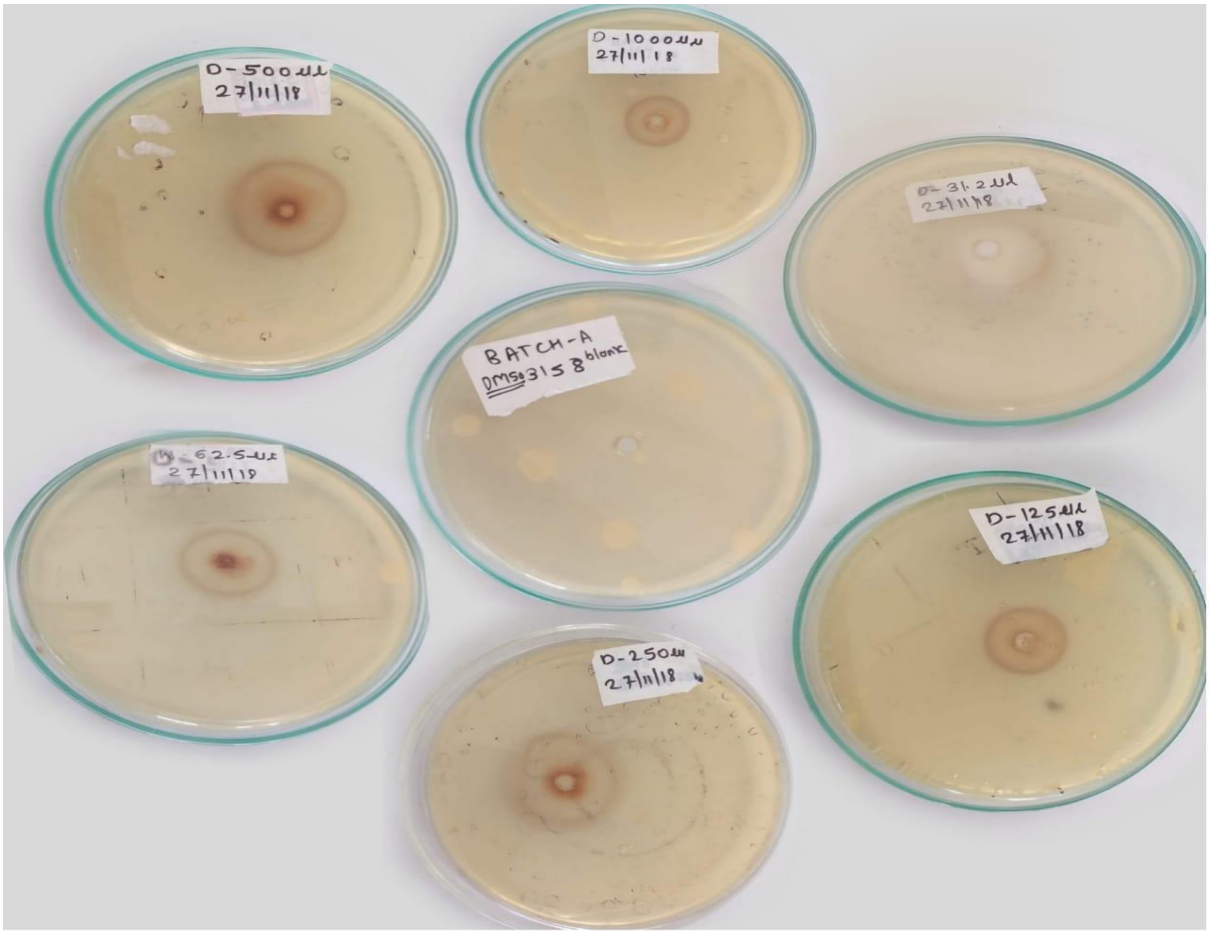

Fig. 1.4 Study to determine MIC of Extract against *Streptococcus mutans (MTCC 497t)*

Initial Antibacterial Study Of EthanolicExtract Of Pomegranate Peel Powder, chewable tablet of pomegranate peels, DMSO Blank was tested against *Streptococcus mutans* (MTCC 497t)as shown in fig.1.5 and table no.5

Table no: 5 Antibacterial activity of Chewable tablet

Sr. no.	Sample solution	Concentration in well (mg)	Zone of inhibition (mm)			
			Initial Tablet	First month	second month	Third month
1	Ethanolic extract	1.56	17	NA	NA	NA
3	Pomegranate peel chewable tablet.	11.25 (equivalent to 3.75 extract)	31	28	29	28
4	DMSO	-	-	-	-	-

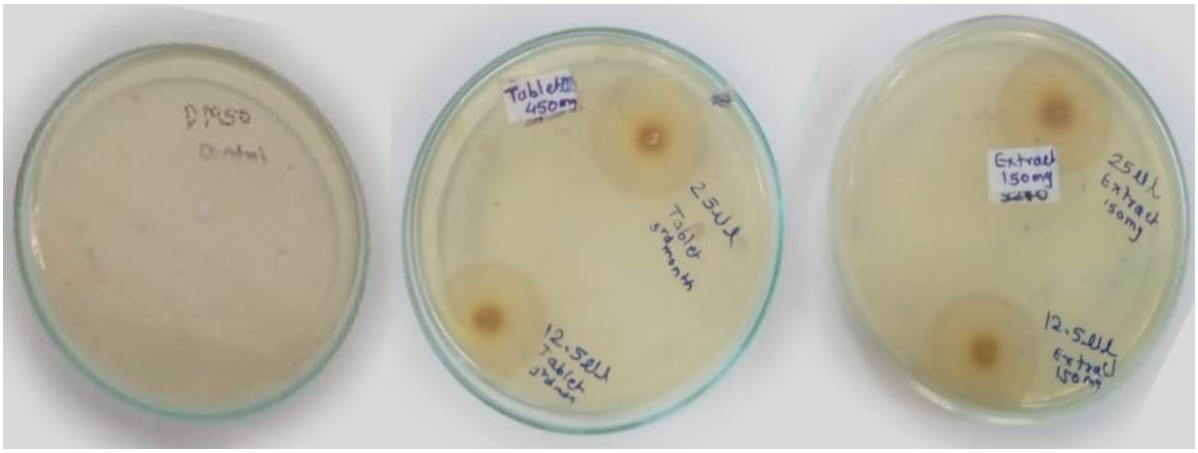

Fig.1.5 Zone of inhibition checked for DMSO blank, Chewable tablet of pomegranate peels, ethanolic extract of pomegranate peels.

CONCLUSION:

The chewable tablet prepared of the pomegranate peel powder extract can be used as a potential treatment of dental caries.It is seen that prepared chewable tablet can be a good dosage form for the dental caries treatment.The activity was retained even upon exposure of tablets to accelerated storage condition of 40^0C 75% RH for 3 months.

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