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EXTRACTION, INVITRO SCREENING AND PREPARATION OF TABLETS FROM DRAGON FRUIT PARTS

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ABSTRACT

Background: The dragon fruit is an epiphyte which belongs to the family Cactaceae. The botanical name of dragon fruit is called hylocereus undatus. The aim of the study is to prepare the tablets and evaluate Invitro screening tests by using the dragon fruit part extracts as a binder. The study focuses on the comparison of different concentrations of the binder with the synthetic binder and marketed tablets. **Methods:** The different extracts obtained from the fruit are subjected to various tests like phytochemical screening for the presence of phenolic compounds. The other Invitro screening tests are performed to check the antioxidant and antibacterial activities. The micro dilution method and agar cup plate method were used to study the antibacterial property. The DPPH method was performed to study the antioxidant property. **Results:** The pulp extract and seed extract showed good antibacterial activity. The seed extract showed the high inhibition percentage in antioxidant activity. Finally the tablets were punched after performing the above various tests by using various concentrations of fruit extract along with the API Naproxen and other Excipients. The evaluation tests were performed as per the guidelines of I.P. The drug release profiles of extracts of pulp 5% and pulp 10% showed the good dissolution rate which is almost nearer to standard drug Naproxen. **Conclusion:** Finally ,all the tablets with varying concentrations are compared with marketed drug Naproxen and found that the dragon fruit extract is showing binding property and can be used as natural binder instead of synthetic binder and can also be used for the sustained release formulations in the upcoming future.

KEYWORDS: Dragon fruit, DPPH, Antibacterial activity, Antioxidant activity, Naproxen,

Natural binder, Sustained release.

Index Terms: Introduction[1], Materials and Methods[2] Invitro screening tests[3], Preparations of Tablets[4], Evaluation of tablets[5] "FTIR Studies, Dissolution Studies, Friability test, Hardness test, Weight variation tests, Thickness test." Results[6], "FTIR Studies, Dissolution studies", Summary[7], Conclusion[8] and Refernces[9]

1. INTRODUCTION

The dragon fruit is an epiphyte plant which belongs to the family Cactaceae family. It is principally originated from the tropical and subtropical regions, but their growth is rich in the European countries due to its fruit exotic value. The name of the dragon fruit differs from region to region. For example, the dragon fruit in Israel is called Pitahaya fruit and buah naga in Indonesia. The botanical name of the dragon fruit is called as Hylocereus undatus. Based on nature of stem habit and pulp color the edible dragon fruit is classified into different varieties. The different varieties of dragon fruit are mentioned below:

- Hylocereus undatus
- Hylocereus triangularis
- Hylocereus costaricensis
- Hylocereus polyrhizus
- Hylocereus megalanthus

Taxonomy

The genus Hylocereus is a small genus that contains about 18 tropical American species. The name Hylocereus genus is vine (climbing with aerial roots or epiphytic in nature). Cacti with three angled stems and mostly with very fragrant nocturnal white flowers. Dragon fruit is a common name for fruits of several cacti species. As these are new crops, their taxonomical identity is not yet known completely it is in confusion.

Fruit morphology: The fruit is a medium to large, oblong-shaped epigenous berry. The berry is distinguished with red skin with large scales. The fruit pulp may be white, red or yellow and juicy depending on the varieties/species.

Properties of Species, Uses, And Products

Dragon fruit is a nutritious fruit with a variety of uses, although the composition of this species has not been extensively studied, particularly with reference to the components of the

fruit. The most valuable and commonly used edible part of Dragon fruit is the fruit pulp which constitutes 70- 80% of the ripe fruit.

The most valuable and commonly used edible part of Dragon fruit is the fruit pulp which is eaten raw as a fresh fruit. The pulp constitutes 70-80% of the ripe fruit. The flavor of fruit pulp is sometimes similar to that of the Kiwi fruit. Dragon fruit pulp could be chilled and cut into half to show the attractive flesh, either sliced or scooped with spoon. It is widely used in the preparation of cakes and salads.

Fig 1: Dragon fruit plant.

The nomenclature of Dragon fruit is as follows:

Kingdom	Planate (Plants)
Subkingdom	Tracheobionta (vascular plants)
Super division	Spermatophyta (seed plants)
Division	Magnoliophyta (flowering plants)
Class	Magnoliopsida (dicotyledons)
Order	Caryophyllales
Family	Cactaceae (cactus)
Subfamily	Cactoideae
Tribe	Hylocereae
Genus	Hylocereus.
Species	Hylocereus undatus

2. MATERIALS AND METHODS

The different extracts obtained from the fruit are subjected to various tests like phytochemical screening for the presence of phenolic compounds. The other Invitro screening tests are

performed to check the antioxidant and antibacterial activities. The micro dilution method and agar cup plate method were used to study the antibacterial property. The DPPH method was performed to study the antioxidant property.

Extraction Process

The above-dried materials especially seed and peel powders are subjected for the extraction process.

- The extraction process is carried out by using a Soxhlet apparatus. The powdered drug is packed and the thimble is prepared which is placed in the column. The flask is filled with the solvent ethanol in order to collect the extract and apparatus is set to run with the help of mortar and electricity for the extraction. The extraction process is carried out for 48hrs to each part of the dragon fruit separately and the extract is collected by the bottom flask which is present with the ethanol. The solvent is taken in order to separate and collect the extract of three different parts of dragon fruit. The solvent is subjected for heating to evaporate the solvent so that the extract residue is obtained finally. Thus the extracts from different parts of the dragon fruit are prepared and kept for the phytochemical screening test and other tests

3. INVITRO SCREENING TESTS

1. Antibacterial activity

a. Agar cup plate method

Prepare the stock solution of the given samples as 300mg/ ml.Prepare the dilutions of the samples as 1000µg/ml, 2000µg/ml and 4000µg/ml.

- Melt the nutrient agar and maintain it at 50°-55°c.
- Add1ml suspension of the test organism to the medium thoroughly while maintaining the temperature at 50°c.
- Pour the above mixture into Petri dishes to form a layer of about 3mm thickness Allow the medium to solidify.
- Cut the reservoirs with sharp tools such as cork borer. Remove the cylindrical plugs with a scalpel or sharp forceps.
- Mark the cups as per dilutions and add in each cup the respective dilutions of the sample.
- Now add the given samples (seed, peel & pulp extracts) which are diluted from the stock solutions.
- Keep the plate carefully in the refrigerator for the diffusion of the sample for 20 mins

- Incubate all the tubes for 20 -24 hrs at 30°-35.
- Observation: Record the size of the inhibition zone against each standard dilution and the unknown dilution. The size is measured in mm with the help of scale.

b. Minimum inhibitory concentration

- Micro dilution method was performed to know the MIC for the given samples.
- The sample extracts are diluted to eight different concentrations from the stock solution.
- To continue the further process we need to subculture the medium.
- The nutrient broth is directly inoculated with the two different bacterial strains in the presence of laminar airflow and incubated for 24 hrs 30°-35°c.
- After incubation, the test tubes containing the subcultures are filled with a measured quantity of sample extracts (seed, peel& pulp).
- Incubated again for 24 hrs 30°-35°c.

- Observe the results carefully.

The clear samples indicate the presence of antibacterial activity whereas turbid formation indicates the presence of microorganisms.

2. Antioxidant activity

- Antioxidants are compounds that inhibit oxidation. Oxidation is a chemical reaction that can produce free radicals, thereby leading to chain reactions that may damage the cells of organisms. Antioxidants such as thiols or ascorbic acid (vitamin C) terminate these chain reactions.

DPPH Method

- DPPH (2, 2-diphenyl-1-picrylhydrazyl- hydrate) free radical method is an antioxidant assay based on electron-transfer that produces a violet solution in ethanol. This free radical, stable at room temperature, is reduced in the presence of an antioxidant molecule, giving rise to colourless ethanol solution. The use of the DPPH assay provides an easy and rapid way to evaluate antioxidants by spectrophotometry, so it can be useful to assess various products at a time.
- The percentage of antioxidant activity (AA %) of each substance was assessed by DPPH free radical assay.
- The samples were reacted with the stable DPPH radical in an ethanol solution.
- The reaction mixture consisted of adding 0.5 ml of sample, 3 mL of absolute ethanol

and 0.3 ml of DPPH radical solution 0.1 mM in ethanol.

- When DPPH reacts with an antioxidant compound, which can donate hydrogen, it is reduced. The changes in colour (from deep violet to light yellow) were read [Absorbance (Abs)] at 517 nm after 100 in of reaction using a UV-VIS spectrophotometer. 01'1]

4. Preparation of tablets: To punch the tablets from dragon fruit parts the following are required:

- API(Naproxen)
- Excipients
- Starch/dragon fruit extracts (5%&10%)
- Lactose (30%)
- Magnesium stearate (5%)
- Talc (5%)
- Polyvinyl pyrrolidine (5%)
- The different parts of dragon fruit extracts are used as a natural binder in the preparation of tablets and their drug release rate is compared with the synthetic binder available in the market. The tablets are punched using two different concentrations of natural binders (5% & 10%).
- The process also includes the wet granulation method in order to form small granules used for punching the tablets. The active ingredient concentration is taken as 250mg (API).The solvent ethanol is used for wet granulation process. The punching is performed by using ten's rotary punching station machine with a die cavity containing 9mm.

5. Evaluation of tablets

- The solubility parameters are observed for naproxen drug containing a synthetic binder and natural binder.

- **Dissolution:** Buffer: 0.1 M of a phosphate buffer with a pH of 7.4, 2.62 g/L of monobasic sodium phosphate and 11.50 g/L of anhydrous dibasic sodium phosphate
- Medium: 900 mL
- Apparatus 2: 50 rpm
- Time: 45 min
- Dissolution was performed with the marketed naproxen tablets and punched tablets containing the natural binder.

- **Hardness test:** Tablet hardness is usually expressed as the load required crushing a tablet placed on its edge. Hardness is thus sometimes termed the tablet crushing strength. The suitability of a tablet in regard to mechanical stability during packaging and shipment can usually be predicted on the basis of hardness. Tablet hardness, in turn, influences tablet density and porosity. It may affect tablet friability and disintegration time. It usually affects drug dissolution and release and it may affect bioavailability.
- **Friability test:** Friability is the property of the tablets to remain intact, when tablets are subjected to a rotatory motion, e.g. during the tablet coating processing of, tablet packaging or transport, as this may cause small particles to abrade from the surface of the tablet. In order to avoid those problems, the friability test is performed. The Roche friabilator is the most common type of friabilator which is used to measure friability and is rotated at 25rpm for 4mins. After processing reweigh the tablets. Weight loss indicates as the percent friability and the loss of weight should not more than 1%.

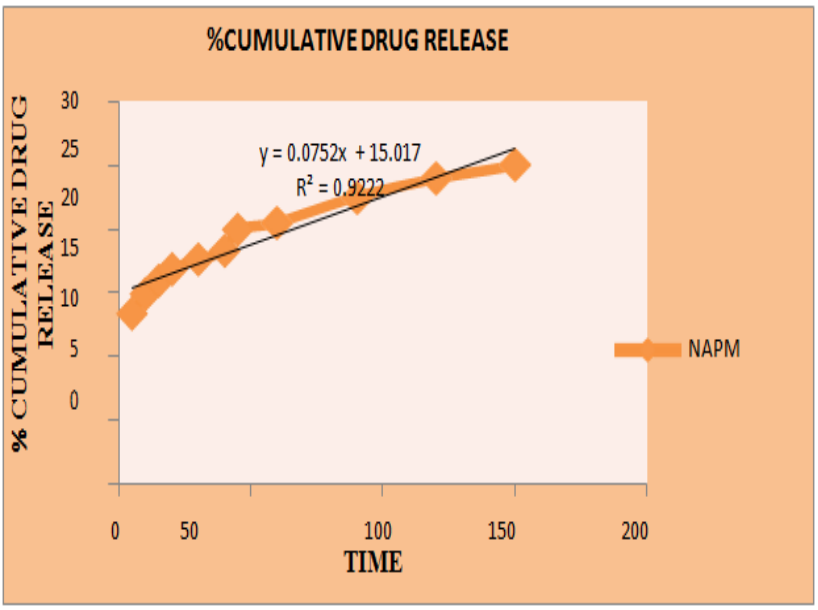
6. RESULTS AND DISSOLUTION

The dissolution test was performed with the marketed tablet naproxen according to the specifications in USP and BP. The average dissolved percentage was calculated 90% that comply with limits.

Table 1: Drug release profile of Naproxen.

Time	% Cdr Of Naproxen
5	48.0%±0.3
10	53.8%±0.24
15	57.5%±0.21
20	60.8%±0.4
30	63.5%±0.22
40	65.9%±0.27
45	71.9%±0.09
60	81.1%±0.35
90	85.3%±0.3
120	86.2%±0.72
150	89.9%±0.4
180	93.5%±0.17

➢ All values are expressed as mean value ± SD (n =3)



Graph: The graph is plotted between %cumulative drug release and time.

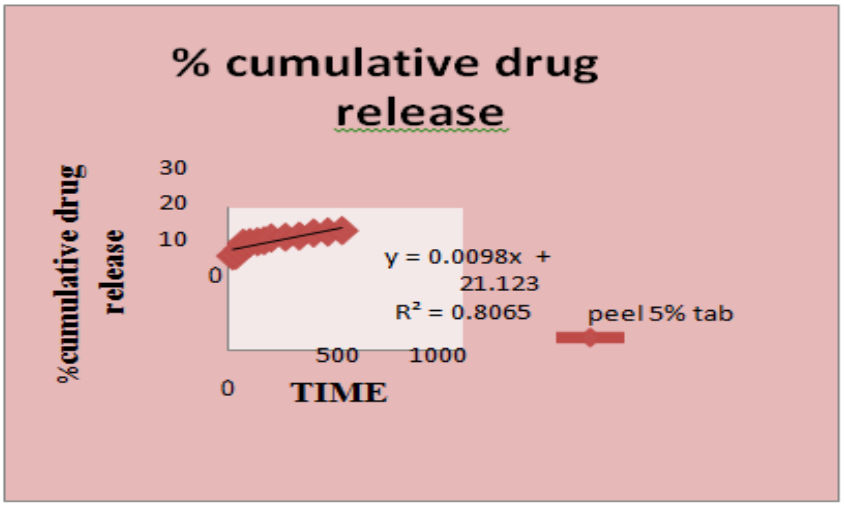
DISSOLUTION PROFILE OF DRAGON FRUIT TABLET

The tablets were punched by using the peel extract of dragon fruit. In this process, the peel extract is used as a natural binder in order to punch the tablets. The two different concentrations (5% and 10%) of natural binders are used. The synthetic binder starch is replaced with the different extracts of dragon fruit. The different types of extracts are peel 5%, peel 10%, pulp 5%, pulp 10%, seed 5%, and seed 10% .The different dissolution profiles were compared and their average dissolved percentages are calculated.

Table 2: Drug release prolife of peel 5% extract.

TIME	%CDR
15	19.89
30	20.12
40	21.32
45	22.53
60	22.74
120	22.91
150	23.13
180	23.64
240	23.86
300	24.10
360	24.67
420	24.92
480	25.2

- The average dissolved percentage of tablets which are made from the peel 5% extract of dragon fruit is calculated as 90.7%

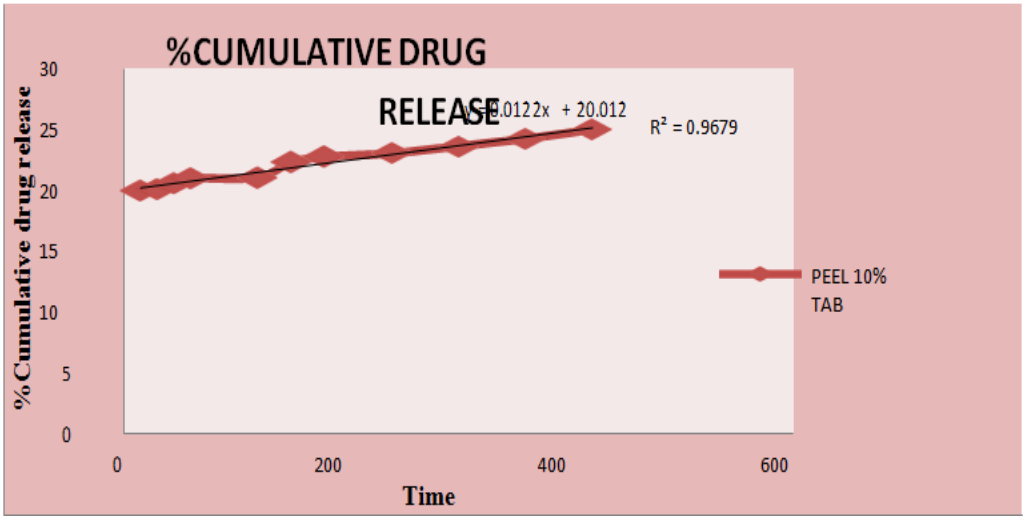


Graph: The graph is plotted between %cumulative drug release and time.

Table 3: Dissolution profile of peel extract 10%.

TIME	%CDR
15	19.96
30	20.08
40	20.56
45	20.98
60	21.04
120	22.31
150	22.74
180	23.03
240	23.62
300	23.84
360	24.23
420	24.98

- The percentage of cumulative drug release was found to be 89.9%.

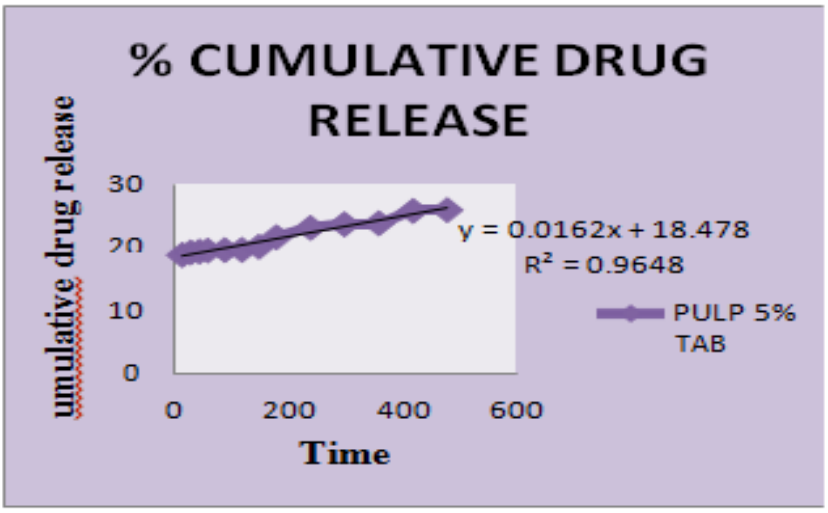


Graph: The graph is plotted between %cumulative drug release and time.

Table 4: Dissolution Profile Of Pulp Extract 5%.

Time	% cdr
15	18.89
30	19.28
40	19.4
45	19.56
60	19.63
120	19.68
150	20.13
180	21.68
240	23.7
300	23.84
360	25.8
420	25.93

- The percentage of cumulative drug release was found to be 93.3%

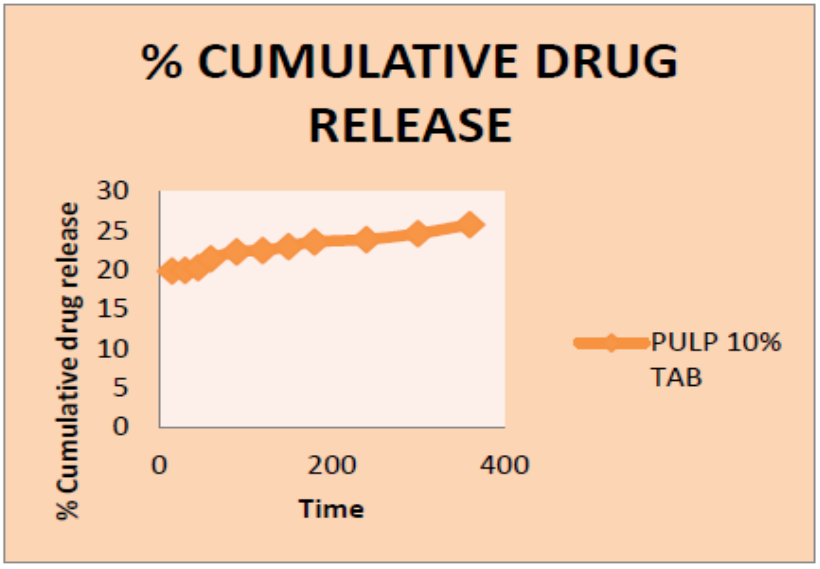


Graph: The Graph Is Plotted Between %Cumulative Drug Release And Time.

Table 5: Dissolution profile of pulp extract 10%.

Time	% cdr
15	19.2
30	19.65
40	19.89
45	20.97
60	21.02
120	22.08
150	23.91
180	24.07
240	24.83
300	25.31
360	25.69

- The percent cumulative drug release was found to be 92.9.

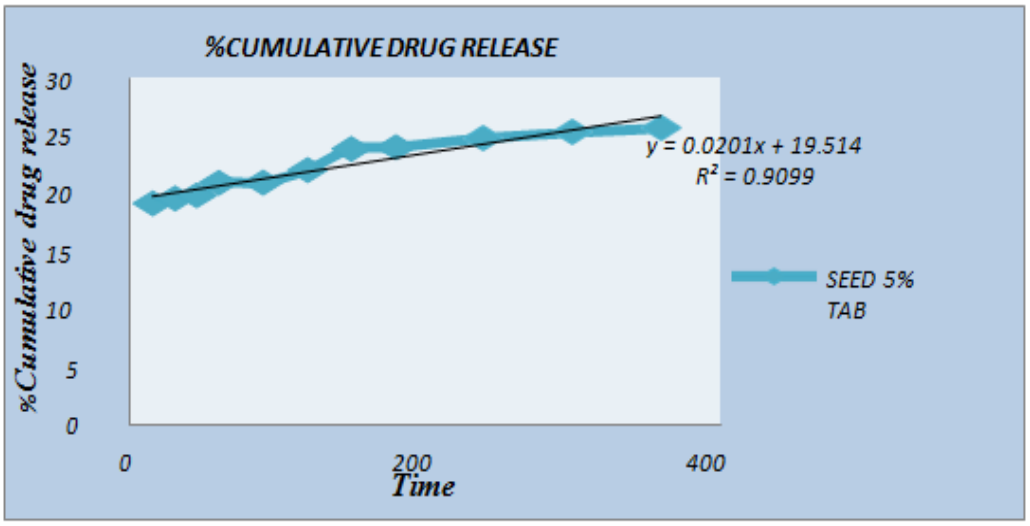


Graph: The graph is plotted between % cumulative drug release and time.

Table 6: Dissolution profile of seed extract 5%.

TIME	%CDR
15	19.89
30	20.01
40	20.36
45	21.48
60	22.34
120	22.52
150	23.02
180	23.62
240	23.92
300	24.67
360	25.82

- The percent cumulative drug release was found to be 92.4%

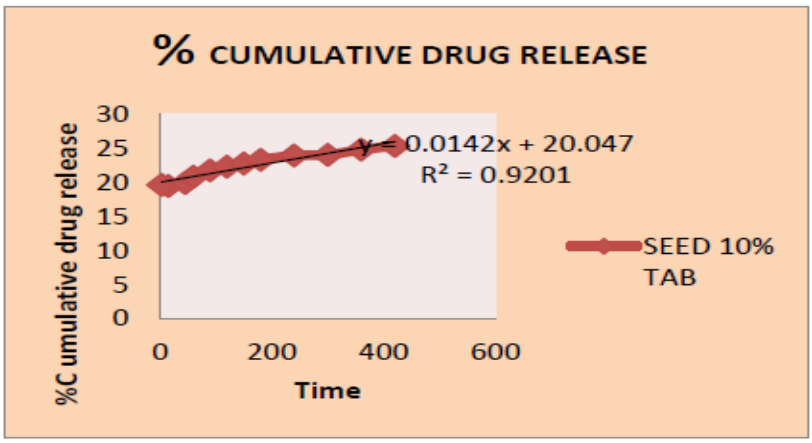


Graph: The graph is plotted between %cumulative drug release and time.

Table 7: Dissolution profile of seed extract 10%.

Time	% cdr
15	**19.5**
30	19.68
40	19.98
45	20.86
60	21.83
120	22.37
150	22.80
180	23.35
240	23.97
300	24.08
360	24.83
420	25.39

- The percent cumulative drug release was found to be 91.4%



Graph 22: The graph is plotted between %cumulative drug release and time.

Table 8: Overall dissolution profile of dragon fruit extracts.

TIME	Peel extract(%CDR)		Seed extract (%CDR)		Pulp extract(%CDR)	
	5%	10%	5%	10%	5%	10%
15	71.6%±0.2	71.8%±0.17	69.12%±0.58	70.2%±0.13	68.0%±0.19	71.6%±0.65
30	72.4%±0.19	72.2%±0.19	70.7%±1.15	70.8%±0.22	69.4%±0.30	72.0%±0.78
40	76.7%±0.25	74.0%±0.25	71.6%±0.48	71.9%±0.49	69.8%±0.55	73.2%±0.21
45	81.1%±0.32	75.5%±0.22	75.4%±0.93	75.0%±0.71	70.4%±0.78	77.3%±0.89
60	81.8%±0.56	75.7%±0.49	75.6%±0.85	78.5%±0.35	70.6%±0.27	80.4%±0.12
120	82.4%±0.65	80.3%±0.23	79.4%±0.21	80.5%±0.52	70.8%±0.21	81.0%±0.63
150	83.2%±0.8	81.8%±0.52	86.0%±0.75	82.0%±0.47	72.4%±0.17	82.8%±0.55
180	85.0%±0.75	82.9%±0.86	86.6%±0.11	84.0%±0.24	78.0%±0.48	85.0%±0.98
240	86.0%±0.64	85.0%±0.98	89.3%±0.39	86.2%±0.41	83.2%±0.85	86.1%±0.78
300	86.7%±0.78	85.8%±0.83	91.1%±0.58	86.6%±0.51	85.3%±0.72	88.8%±0.54
360	88.8%±0.36	87.2%±0.93	92.4%±0.88	89.3%±0.22	85.8%±1.5	92.9%±0.99
420	89.7%±0.44	89.9%±0.62	-	91.4%±0.90	92.8%±1.08	-
480	90.7%±0.61	-	-	-	93.3%±0.98	-

- The high dissolution rate was found to be 93.3% for the pulp extract having 5% concentration and then 10% pulp extract with 92.8%
- All values are expressed as mean value ± SD (n =3)

- The high dissolution rate was found to be 93.3% for the pulp extract having 5% concentration and then 10% pulp extract with 92.8%
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SUMMARY

Table 13: Different evaluated parameters.

PARAMETERS	Marketed tablet	Peel 5% tablets	Peel 10% tablets	Pulp 5% tablets	Pulp 10% tablets	Seed 5% tablets	Seed 10% tablets
THICKNESS (mm) (n =10)	7.5mm	6.75m	7.2m	5.5mm	6.5mm	7.2mm	6.3mm
HARDNESS (Kg) (n =10)	14kg	10kg	12.8kg	15kg	14.2kg	16kg	16.4kg
DISSOLUTION (%) (n =3)	93.5% ±0.17	90.7% ± 0.6	89.95% ± 0.6	93.3% ± 0.9	92.9% ±0.3	92.4% ± 0.8	91.4% ±0.90
FRIABILITY (%) (n =10)	0.123% ±0.3	0.257% ±0.5	0.406% ±0.44	0.510% ±0.52	0.623% ±0.39	0.668% ±0.14	0.732% ±0.78
WEIGHT VARIATION (mg) (n =10)	701.2mg ±0.12	750.5mg ±0.44	658.3mg ±0.39	650.2mg ±0.86	710.8mg ±0.25	680.9mg ±0.74	580.3mg ±0.9

- All values are expressed as mean value ± SD

CONCLUSION

- The different parameters were evaluated and the results were found to be satisfactory. The two methods were performed to estimate the antibacterial activity.
- The agar plate cup method showed good antibacterial activity and confirmed that the dragon fruit extracts have antibacterial activity.
- The antioxidant activity is more for the seed extract when compared to peel and pulp extract.
- Presences of phenolics are very important to show the activity of antioxidant property.
- The phytochemical screening is performed in detail to confirm the presence of the phenolics in the dragon fruit parts.
- Finally, the different parts of dragon fruit namely pulp, seeds and peel showed the presence of phenolics and other constituents paving the way to carry out the further project work successfully.
- The Invitro screening for both activities are performed and tablets were punched by using

fruit parts and they are subjected for different evaluation tests in order to compare the level of activity.

- The other tablets are punched by using various concentrations of extracts and evaluated.
- Finally all the tablets with varying concentrations are being compared with marketed tablet Naproxen and found that the dragon fruit extract which is used as natural binders are showing good effect as binder such that they can be used for the preparation of sustained release formulations in the upcoming future. so, we can formulate the innovative drugs from this dragon fruit extracts by showing antioxidant and antibacterial activities.

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