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## Assessment of Multifacet Role of Biowaste for Pharmaceutical and Cosmetic Purposes



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### ABSTRACT

Nowadays various materials are obtained which contain chemicals and various inorganic matter which at times cause harm to the people when in use. Hence to overcome this problem we selected a bio waste material, date seed powder which showed several properties in all aspects. The absorbing properties of the date seed powder made us understand its role as a very powerful adsorbent for various pharmaceutical purposes. The stability studies and the coloring properties of the date seed powder gave us an insight into various natural pigments which were present in the biowaste pit. Date seed powder in the activated form also possesses adsorbent properties. Hence on this basis, we formulated a face wash replacing activated charcoal which is available on market. The face wash formulation helped us to note its skin soothing effect with fewer chemicals and would cause less irritation to the skin as compared to charcoal-based facewashes.



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## 1. INTRODUCTION

Biowastes are considered renewable resources whose potential deserves to be studied to optimize their production and development. Date kernels (seeds), like dates fruits, have numerous benefits and use to treat and release many diseases also, date seeds, like many other kernels, including avocado kernels, mango kernels, apricot kernels, and apple kernels, have much nutritional value. Date seeds powder is made from burnt or roasted kernels. This amazing biowaste powder contains compounds that are chemically composed of saturated and unsaturated fatty acids, zinc, cadmium, calcium, and potassium. Saturated fatty acids include stearic and palmitic acids, and unsaturated fatty acids include linoleic and oleic acids, which can inhibit the action of the enzyme  $5\alpha$ -Reductase. Excipients are defined as inert substances added to a drug or food to confer a suitable consistency, appearance, or form. Color selection is one of the key elements of building a strong brand development and product identity in the pharmaceutical industry, besides preventing counterfeiting. Moreover, colored pharmaceutical dosage forms may increase patient compliance and therapy enhancement.

## 2. MATERIAL AND METHODS

Waste date pits (seeds) were used in the present study. They were washed and rinsed with distilled water to eliminate sand and others. Impurities. Then they are dried in the ambient air for a week (without being exposed to the sun) and ground to be transformed into powder. Sodium chloride, hydrochloric acid, and ethanol were purchased from S.D fine chemicals and performed major types of studies concerning date seed powder.

1] Phytochemical Screening

2] Colouring Property Studies

Optimization of extraction process 10gms of date seed powder was dissolved in 100 ml of water to optimize the following parameters:

- Selection of extraction method
- ✓ Magnetic stirring (Control)
- ✓ Bath Sonicator
- ✓ Ultrasonication (ultra-cavitation)

- Extraction Time
- Selection of Ideal pH conditions
- ✓ Acidic
- ✓ Alkaline
- ✓ Neutral
- Evaluation of adsorbent properties of activated Date seed powder
- Formulation of face wash

### **3. METHODOLOGY**

#### **3.1 EXTRACTION OF COLORED COMPONENTS:**

a) Date seeds were powdered using a grinder and sieved. 20 g was macerated with distilled Water (150 ml) and refluxed for 3 hours. The extract was filtered and kept for further use.

b) Date seed powder (20g) was weighed and macerated with 1% NaOH (150ml) solution and refluxed for 3 hours. The filtrate was kept for further use.

#### **3.2. EXTRACTION OF COLOURED COMPONENT AT DIFFERENT pH:**

##### **a) Aqueous method**

A 5g powdered sample was taken and boiled with 50ml of water at 100 degrees Celsius. The solution was then filtered and pH was recorded.

##### **b) Alkaline method**

1g of NaOH was dissolved in 100 ml of water. The powder sample was boiled in the Made alkaline medium. The solution was cooled and filtered and the pH was recorded.

##### **c) Acidic method**

1ml of HCL was dissolved in 100 ml of water. The powdered sample was boiled in this Medium. The solution was filtered and pH was recorded.

#### **d) Alcoholic method**

50ml of ethanol was added to 50 ml of water. The powdered was added to this medium and boiled. The solution was filtered and pH was recorded.

### **3.3. SELECTION OF EXTRACTION TECHNIQUE**

#### **3.3.1 EXTRACTION USING ULTRASOUND:**

1g of sample was taken and 50ml water was added in a beaker and it was covered with Aluminum foil. The ultrasonic probe was lowered into the beaker and started. At every Half, an hour interval the sample was withdrawn and analysis was done using UV-Vis Spectrophotometer. The same procedure was repeated with ethanol and UV analysis was done.

#### **3.3.2. EXTRACTION USING BATH SONICATOR:**

1g of sample was taken and 50ml water was added in a beaker and kept in the bath Sonicator for 3 hours. After every half an hour the sample was withdrawn and analyzed using a UV-Vis spectrophotometer. The same procedure was repeated with ethanol and UV analysis was done.

#### **3.3.3. EXTRACTION USING MAGNETIC STIRRER**

1g of sample was taken and 50ml water was added to a beaker and kept on magnetic stirrer.

For 3 hours. After every half an hour the sample was withdrawn and analyzed using a UV-Vis spectrophotometer.

### **3.4. UV SPECTROSCOPIC ANALYSIS OF COLORED COMPONENTS:**

The extracted sample was analyzed using a Shimadzu UV-Vis spectrophotometer in the Range of 200-400nm.

### **3.5. PHYTOCHEMICAL ANALYSIS:**

The powdered sample of date seeds was tested for the phytochemicals such as Carbohydrates, proteins, amino acids, alkaloids, flavonoids, tannins, saponins, etc.

### 3.6. GRAVIMETRIC ANALYSIS:

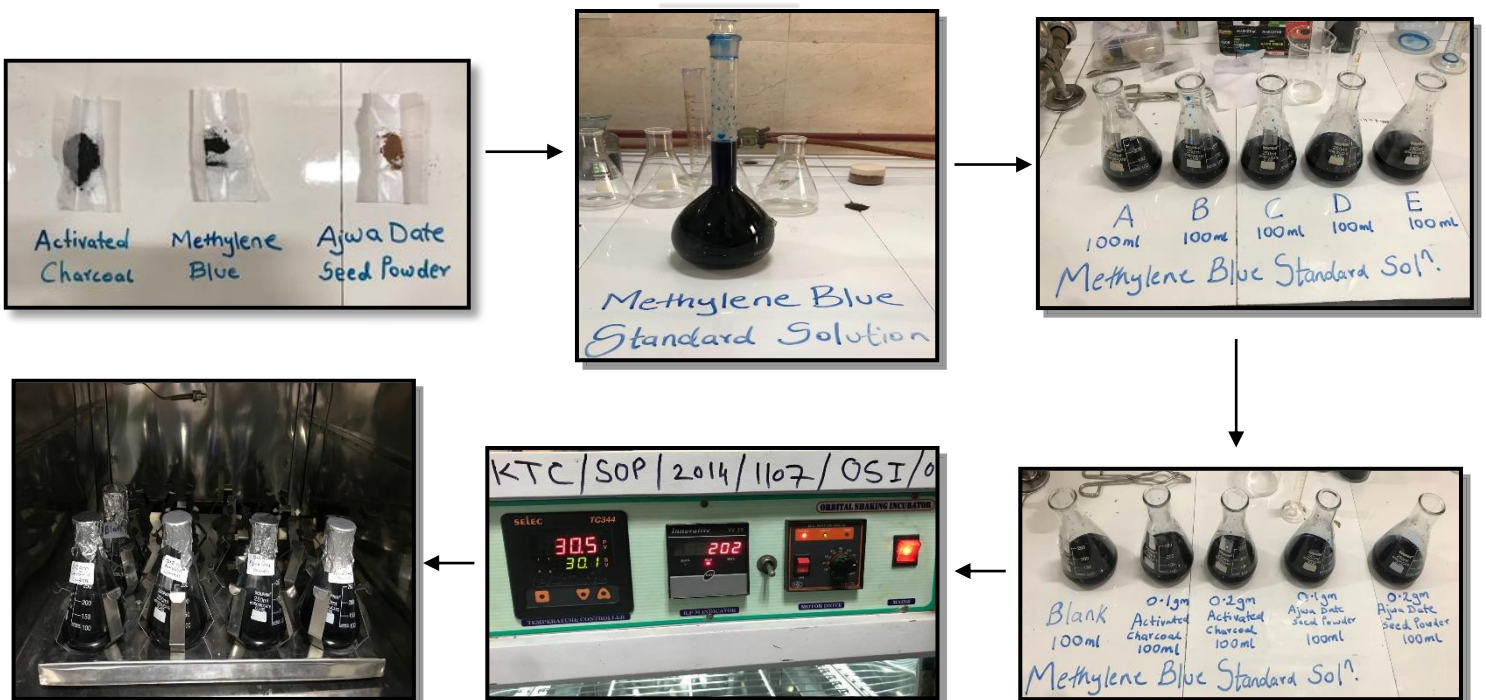
The extracted solution each from the bath sonicator, probe sonicator, magnetic stirrer, and Reflux condenser, all subjected to gravimetric analysis. The extract was taken in the Porcelain dish and then kept in a hot air oven and the solvent was evaporated. The amount of colored component obtained was recorded and the % yield was calculated using the

$$\text{Formula: \% yield of natural colorant} = \frac{\text{natural dye extract obtained (g)}}{\text{amount of plant material used (g)}}$$

### 3.7. STUDY OF ADSORBING PROPERTIES OF DATE SEED POWDER

- Preparation of methylene blue 125 mg (0.125 gm) of methylene blue powder was weighed and dissolved in distilled water using a volumetric flask and homogenized for about 30 minutes. After the homogenization process measure about 100ml of methylene solution into each flask by using a measuring cylinder. Weighed masses of activated carbon and date seed powder were transferred into each flask and sealed properly and kept on the shaker at the speed of 200rpm at a particular period for the adsorption process till it reaches equilibrium.

#### PRACTICAL ASPECT



### **3.8 ACTIVATION OF DATE SEED POWDER**

Weighed 3gm of date seed powder was transferred to a beaker and 3gm of zinc chloride was added to the same beaker and half a quantity of water was added to the beaker containing powder and zinc chloride. The mixture was boiled for 30 minutes.

After 30 minutes allow the solution to cool and keep it aside without disturbing it for 24 hours. Filter the above solution and wash the filtrate at least thrice with water and allowed it to dry completely in a hot air oven. After the powder was dried transfer the same to the crucible and keep the same crucible in a muffle furnace at 250 degrees until the powder turns brownish-black for 24 hours.

### **3.9 COLOURING PROPERTIES OF DATE SEED POWDER AS HAIR DYE USING NATURAL FIBRE. NAME OF THE FIBRE - WOOL FIBRE**

The impact of coloring properties of dye extracted from date seed powder was evaluated using an animal fiber model.

Four types of extracts were made using date seed powder and used on fiber.

The fiber used was – wool fiber.



#### **1] Control sample**

Simply the date powder extract was used with wool fiber and seen under a microscope.

#### **2] Acidic extract**

The date seed extract was acidified with HCl and the fiber was dipped in the solution and observed under a microscope.

#### **3] Basic extract**

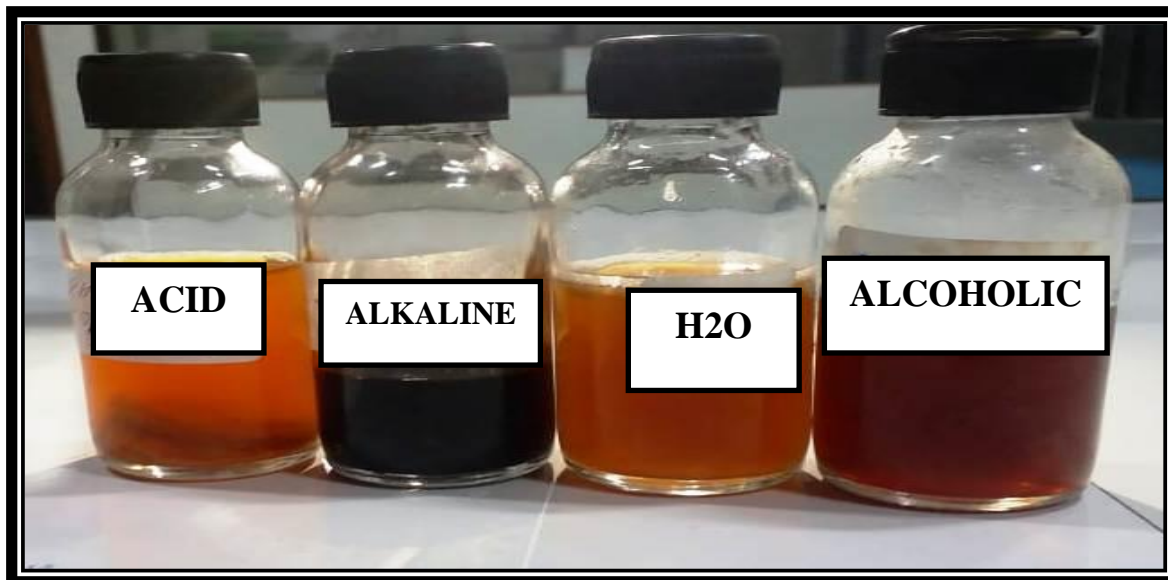
The date seed extract was alkalized with NaOH and the fiber was dipped in the solution and observed under a microscope.

#### **4] Alcoholic extract**

The date seed extract was prepared by adding alcohol and the fiber was dipped in the solution and observed under a microscope.

### Stability studies of extract

All four extracts were kept at room temperature (30-31°C) in a tightly closed container for further use.



### 3.10. FACE WASH FORMULATION USING DATE SEED POWDER

PHASE	SR .NO	INGREDIENTS	QTY TAKEN	ROLE
A	1	Activate date seed powder	0.1 gm	Excipient
	2	Carbopol 940	0.2 gm	Plasticizer
	3	Propylene glycol	0.2 gm	Viscosity
B	4	Triethanolamine	0.2 gm	Surfactant
	5	Methylparaben	0.015 gm	Preservative
	6	Sodium lauryl sulfate	0.2 gm	Surface active agent
	7	Distilled water	q.s 20 ml	Vehicle

In the market, formulations are available astar based activated charcoal.



## DRAWBACKS OF TAR-BASED ACTIVATED CHARCOAL



- Can also irritation and inflammation, if the skin is too gentle.
- Rubbing on the skin can cause staining problems.

### ❖ Formulation of activated / non-activated date seed powder face wash






1. The required amount of ingredients were weighed. Take Phase 3. Swell the Carbopol 940 in half the quantity of water q.s for 15 mins in a magnetic stirrer at 15 rpm then add propylene glycol and continue stirring until it forms a viscous base. After mixing add the required amount of activated date seed powder to the above mixture(Phase A ).In another beaker add Sodium lauryl sulfate used as a surfacing agent and methylparaben as a preservative( Phase B )After shear stirring gradually phase B mixture was added to phase A and stirred until a smooth mixture is formed.

## 4. RESULTS AND DISCUSSION

### a) PHYTOCHEMICAL SCREENING

SR NO	PHYTOCHEMICAL TEST	OBSERVATION	INFERENCE
1	<b>PROTEINS</b> (Millon's Test)		Protein absent
2	<b>AMINO ACIDS</b> (Ninhydrin Test)		Amino acid present



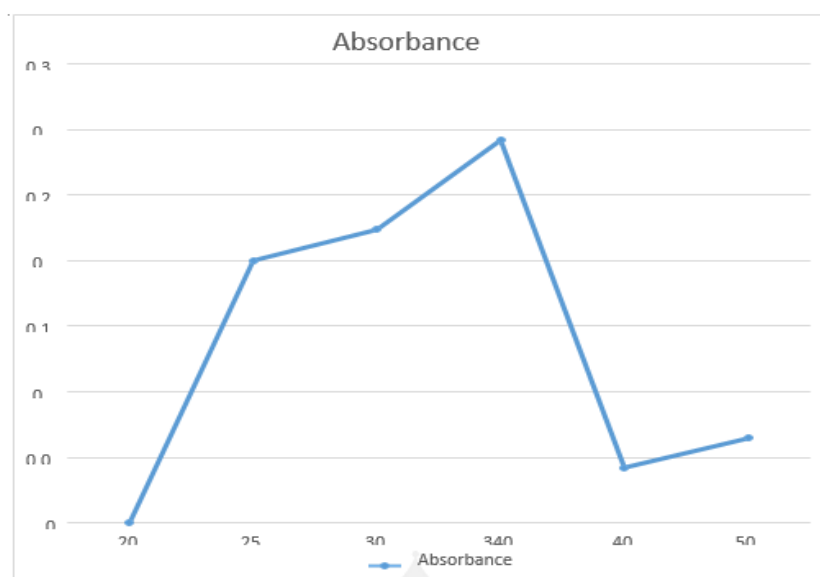
3	<p><b>CARBOHYDRATES</b> (Molisch test)</p>		Carbohydrate present
4	<p><b>FLAVANOIDS</b> (Shinoda Test)</p>		Flavonoids absent
5	<p><b>SAPONIN GLYCOSIDES</b> (Foam test)</p>		Saponin present
6	<p><b>STEROIDS</b> (Salkowoksi test)</p>		Steroid present
7	<p><b>TANNINS</b> (Tannin test)</p>		Tannins present

8	<p><b>ALKALOIDS</b> (Dragondroff test)</p>		Alkaloid present
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It was observed that date seed powder provides a positive result for tannins. As it obtains a dark purple-red color which detects the test to be positive. It was observed that date seed powder contains more amount of lycopene content as well as phenolic compounds, and tannins in them due to which it provides dark red color as its confirmatory color to detect the presence of phytochemicals in it.

**b) CHARACTERIZATION OF AQUEOUS EXTRACT USING UV-VISIBLE SPECTROSCOPY**

The absorbance spectrum of the visible range [200nm-400nm] of the extracted solution was obtained from date palm pits. The aqueous dyeing solution was characterized by UV-visible spectroscopy using Shimadzu model PU UV/visible spectrophotometer. The obtained spectra show the presence of maximum absorbance at 340.4nm.



**Figure No. 1 Visible absorbance spectrum of the extracted solution from date palm and its powder**

## SELECTION OF pH CONDITION

For proteins present overheating could cause protein denaturation and precipitation. For the two studied date varieties, the low solubility of date seed proteins was obtained at pH between 4 and 4.5. Hence the possibility of precipitation in acidic solution could be the possible reason. Higher solubility of proteins may be the possible reason for clarity in alkaline solution. pH conditions.

**Table No. 2. Effect of pH on absorbance and extraction of natural colorant.**

PH CONDITIONS	ABSORBANCE AT 340.4 nm	PRECIPITATION
AQUEOUS	0.0854	YES
ALKALINE	0.3589	NO
ACIDIC	0.2051	YES
ALCOHOLIC	0.1127	NO

**OPTIMIZED EXTRACTION METHOD:** Concerning preliminary studies on the type of solvent, methods, extraction time, and pH, Bath Sonicator was preferred for further extraction process at 30 min under alkaline pH 10 using water as solvent. But overall reflux condenser gives better yield at alkaline medium with the time taken longer for extraction process. The yield obtained in the gravimetric analysis threw light on the above depictions.

**GRAVIMETRIC ANALYSIS:**

The maximum yield was obtained from bath sonication and reflux condenser. Also, at alkaline pH with bath sonication and reflux condenser, the yield was appreciable as compared to other methods. For further reflux condenser and alkaline medium for studies were used.

<b>METHOD</b>	<b>PH</b>	<b>% YIELD</b>	<b>PRECIPITATION</b>
<b>MAGNETIC STIRRING</b>	<b>NEUTRAL</b>	<b>4.2</b>	<b>NO</b>
<b>BATH SONICATOR</b>	<b>NEUTRAL</b>	<b>16.4</b>	<b>NO</b>
<b>PROBE SONICATION</b>	<b>NEUTRAL</b>	<b>13.1</b>	<b>YES</b>
<b>MAGNETIC STIRRING</b>	<b>ACIDIC</b>	<b>10.1</b>	<b>YES</b>
<b>MAGNETIC STIRRING</b>	<b>ALKALINE</b>	<b>13.8</b>	<b>NO</b>
<b>BATH SONICATION</b>	<b>ALKALINE</b>	<b>21.2</b>	<b>NO</b>
<b>REFLUX CONDENSER</b>	<b>ALKALINE</b>	<b>22.7</b>	<b>NO</b>

**c) EVALUATION OF ADSORBING PROPERTIES OF DATE SEED POWDER (ACTIVATED /NON-ACTIVATED)**

<b>TEST SOLUTION</b>	<b>ABSORBANCE</b>
<b>Blank</b>	<b>3.25</b>
<b>0.1 gm activated charcoal</b>	<b>2.92</b>
<b>0.2 gm activated charcoal</b>	<b>1.91</b>
<b>0.1 gm activated date seed powder</b>	<b>2.48</b>
<b>0.2 gm activated date seed powder</b>	<b>2.50</b>

Concerning the adsorbing property studies, it was observed that the reading for the blank sample was 3.25 and there was a comparative study that was done concerning the blank sample. It was observed that in the case of activated charcoal there was a good amount of difference between the solutions whereas in the case of date seed powder there was a slight

difference concerning the solutions used to analyze their absorbance. The result was analyzed using a UV visible spectrophotometer.

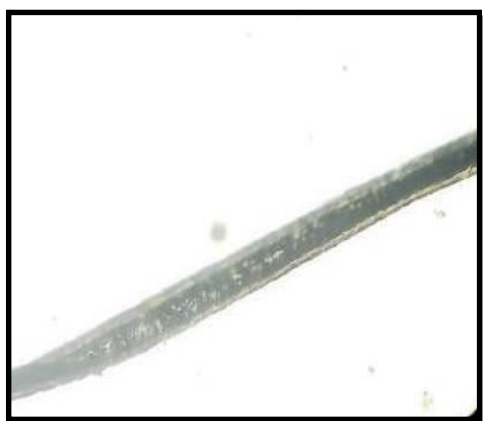
SR. NO	WITH ACTIVATED CHARCOAL		WITH ACTIVATED DATE SEED POWDER	
	Qty	Absorbance	Qty	Absorbance
1	0.1	2.92	0.1	2.86
2	0.2	1.91	0.2	1.75
3	Blank	3.25	Blank	3.25

## DISCUSSION

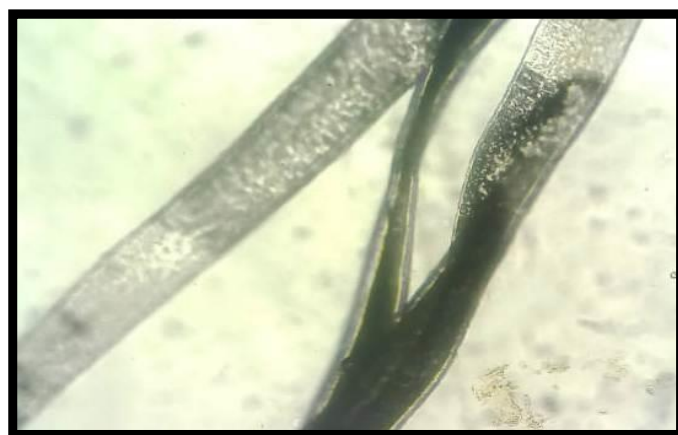
The wavelength selected for the evaluation of date seed powder was 340.4 nm the absorbance was calculated concerning the sample which had only activated charcoal and others that had activated date seed powder it was observed that concerning the blank reading there was a difference seen in the absorbance value of the samples provided. The higher the absorption value better will be the light absorbed by the sample.

### d) COLOURANT EVALUATION OF DIFFERENT PH EXTRACTS ON WOOL FIBRE

CONTROL SAMPLE



FIBER STAINED WITH ACIDIC EXTRACT



**FIBER STAINED WITH  
BASIC EXTRACT**



**FIBER STAINED WITH  
ALCOHOLIC EXTRACT**



## DISCUSSION

It was observed that the extracts which were made were tested on the wool fiber for its color identification. It was observed that the sample which was used as a control sample or the standard sample had no color change concerning the other samples. Concerning the acidic extract, it showed greenish color and the internal structure was visible. Concerning the basic extract, there was orange color visible and concerning alcoholic extract, there was yellow-green color visible.

## EVALUATION OF COSMETIC FORMULATION

Sr.NO	PARAMETERS	OBSERVATIONS
1	COLOUR	BROWN
2	ODOUR	CHARACTERISTIC
3	CONSISTENCY	GOOD
4	pH	7
5	VISCOSITY	1690 cp
6	SPREADABILITY	EASILY SPREADABLE
7	WASHABILITY	EASILY WASHABLE
8	GRITTINESS	PRESENT TO A SLIGHT EXTENT
9	FOAM ABILITY	FOAM VOLUME 100 ML AT 5 MINUTES.

## CONCLUSION

It was also observed that when alkaline conditions were observed extraction of the natural component was in larger amounts. The alkaline extract proves to give more migration of color to wool fiber as compared to that of other pH conditions. Compared to aqueous extract, the alkaline extract was more stable at normal room temperature. There was no precipitation in the alkaline medium, the extract was very clear and very dark in color. The adsorbing property evaluation gave us an insight into the adsorbent nature of activated date seed powder which can be useful in different cosmeceutical formulations with reduced side effects.

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