Qualitative and Quantitative Analysis Date palm (Phoenix Dactylifera)

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Abstract

Background: The Phoenix dactylifera Linn. is a most common plant usually known as date palm, belonging to the family Arecaceae. It is native to North Africa, South- West Asia and is considered as an oldest plant. The date palm is well known for its traditional as well as medicinal value. The active phytoconstituents reported in the fruits are alkaloids, Phenols, glycosides, flavonoids, steroids, and also its fruits are rich source of vitamins, minerals, carbohydrates and proteins. From the existing literature survey Phoenix dactylifera is reported for number of pharmacological activities like analgesic, anti-inflammatory, hepatoprotective, anticancer, antioxidant, anti-proliferative, antifungal and antibacterial activity.

Aims & Objectives: The objective of study is to analyse Phytochemical Organic and Inorganic analysis & Quantitative screening (Total flavonoids and Total phenols) of Date palm

Materials and Methods: Extract of date palm were scrutinized for phytochemical organic and inorganic analysis as well as quantification of Total Phenols and Total flavonoids with spectrophotometer.

Results: High concentration of phenols and flavonoids were observed in date palm fruit, phenols 25.61mg of GA/g equivalent, flavonoids 3.07mg/g of Rutin equivalent.

Conclusions: In phytochemical screening like carbohydrates, phenols, flavonoids, steroids, alkaloids, protein and amino acids, glycosides, were appreciated, In organic analysis sodium, iron, sulphate were appreciated, in quantification High concentration of phenols and flavonoids were observed.

Keywords: Date palm(Phoenix dactylifera), Phenols, Flavonoids.

Study & Article History: Sample Received at 19/05/2022 study conducted in ACRL published in Avishkara Vol 1, Issue 2, July 2022.www.avishkara.in

Introduction

Phoenix dactylifera Linn. (P. dactylifera) is commonly known as date palm belonging to the family Arecaceae (formerly Palmaceae) and has nearly about 14 species also it is consisting of about 200 genera and more than 2500 species. It is native to North Africa, south-west Asia and considered as an

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oldest plant. Traditionally it is important for its nutritional value throughout the world. Very currently the whole genome of date palm tree was again sequenced for the betterment of its growth. The main nutrients of the plant are derived from the fruits. The fruits contain huge amount of carbohydrates, amino acids, vitamins and minerals. The active phytoconstituents present in the fruits are alkaloids, Phenols, glycosides, flavonoids, steroids. Phytoconstituents like flavonoid is the main active constituent of the fruit which shows various pharmacological activities. Apart from the fruit the other parts of the plant like leaves, seeds and roots are also used medicinally. There are several varieties of date fruits and the nutritional values of its individuals are almost same. They all are rich sources of nutrients.

The traditional uses of P. dactylifera are in Ayurveda also, its formulation used as tonic for the cure of Visarpa and Rakta pitta. The fruit pulp of date is considered to be antitussive, expectorant, demulcent, laxative and diuretic. The date palm is also used for the relieving of alcohol induces detoxification. In Siddha system of medicine date palm powder is used for the treatment of dengue and influenza. It is also used in some special case like convalescence from fevers and smallpox. The sweet date pulp is also use in dysentery. Date fruits are also useful for the treatment of asthma and headache. Those patients who are suffering from piles, they can use smoke of dates seed to get relieve from the pain. Dates fruits are also used as expectorant, cough relievers and to prevent constipation. Daily routine consumption of date fruits are helpful in ameliorating cough, rheumatism, burning sensation, nephropathy, bronchitis and sexual debility. Roasted date seeds powder is used as main ingredient in “date coffee”. The juice of the stem of dates palm has reported to have diuretic, demulcent and refrigerant activity in genitourinary infections. The spathes (liquid distillation) of P. dactylifera possesses anti-spasmodic activity. The flower of dates palm is used as a purgative. The pollen grains of P. dactylifera are responsible for the improvement of fertility in women. The daily intake of date palm pollen and the male flowers was believed to be an aphrodisiac and to enhance fertility. Dates are also given to infants with teething problems as are believed to harden the gums. The pharmacological activities of P. dactylifera are shown due to its active constituents. The different chemical constituent shows specific activity like antioxidant potential of plant is due to flavonoid and analgesic activity due to alkaloids

Materials & Methods:

Sample Collection:
Date palm (Khalas) were identified and collected from the local markets of Koppal, All the date samples were collected in the edible stage and identified by experts and taxonomists.

Collection of extraction of plant materials
A total of 250 g of Date palm were macerated in 75% ethanol in distilled water using cold maceration techniques for 48 h, filtered, and then the alcohol was evaporated on water bath. Stock solution (1 mg/ml) of different extract was prepared in methanol.

Phytochemical screening:
Organic analysis like Test for Carbohydrates, Saponin, Phenols, Flavonoids, Steriods, Alkaloids, Anthraquinone, Protein and amminoacids, Anthycanine, Quinone, Glycosides.
Incorganic analysis like test for Calcium, Magnesium, sodim, potassium, Iron, Sulphates, Chloride we analyzed. Table 1 and 2 showing phytochemical organic screening of date palm and Table 2 Inorganic analysis
<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Test</th>
<th>Test Applied/Reagent used</th>
<th>Observation</th>
<th>Inference</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbohydrates</td>
<td>Molisch Test</td>
<td>Violet ring formation</td>
<td>Positive</td>
<td>++</td>
</tr>
<tr>
<td>2</td>
<td>Saponin</td>
<td>Foam test</td>
<td>Foam formation</td>
<td>Negative</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Phenols</td>
<td>Ferric chloride test</td>
<td>Bluish black colour</td>
<td>Positive</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Flavonoids</td>
<td>Conc.H₂SO₄ Test</td>
<td>Orange Colour</td>
<td>Positive</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>Steroids</td>
<td>Salkowakis test</td>
<td>Chloroform layer appear red, acid layer shows greenish yellow fluorescence.</td>
<td>Positive</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>Alkaloids</td>
<td>Dragendorff’s test</td>
<td>Red or Orange Brown colour</td>
<td>Positive</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Anthraquinone</td>
<td>Ammonia Test</td>
<td>Rose Red colour in aqueous layer</td>
<td>Negative</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Proteins &amp; Amino Acids</td>
<td>Xanthoproteic Test</td>
<td>Yellow colour formation</td>
<td>Positive</td>
<td>++</td>
</tr>
<tr>
<td>9</td>
<td>Anthocyanine</td>
<td>2N HCl Test</td>
<td>Pink reddish colour formation</td>
<td>Negative</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Quinone</td>
<td>Conc. HCl Test</td>
<td>Green Colour</td>
<td>Negative</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Glycoside</td>
<td>Alkaline Reagent Test</td>
<td>Yellow colour</td>
<td>Positive</td>
<td>+</td>
</tr>
</tbody>
</table>

**Table 1**: Phytochemical screening of Aqueous Extract of Date Palm (Pheonixdactylifera)
Table 2: Phytochemical screening of Alcoholic Extract of Date Palm (Phoenix dactylifera)

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Test</th>
<th>Test Applied/reagent used</th>
<th>Observation</th>
<th>Inference</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Calcium</td>
<td>Ammonium carbonate</td>
<td>White precipitate</td>
<td>Negative</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Magnesium</td>
<td>Ammonium carbonate</td>
<td>White precipitate</td>
<td>Negative</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Sodium</td>
<td>Potassium Pyroantimonate</td>
<td>White precipitate</td>
<td>Positive</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Potassium</td>
<td>Sodium cobalt nitrate</td>
<td>Yellow precipitate</td>
<td>Negative</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Iron</td>
<td>2% Potassium ferrocyanide</td>
<td>Dark blue colour</td>
<td>Positive</td>
<td>++</td>
</tr>
<tr>
<td>6</td>
<td>Sulphates</td>
<td>5% Barium chloride</td>
<td>White crystalline precipitate</td>
<td>Positive</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Chloride</td>
<td>Lead acetate</td>
<td>White precipitate</td>
<td>Negative</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3: Inorganic Analysis of Date palm (Phoenix dactylifera)

**Determination of Total Phenols:**
The concentration of phenolic in plant extracts was determined using spectrophotometric method. Methanolic solution of the extract in the concentration of 1 mg/ml was used in the analysis. The sample reaction mixture was prepared by mixing 0.5 ml of methanolic solution of extract, 2.5 ml of 10% Folin-Ciocalteu’s reagent dissolved in water and 2 ml 7.5% Na₂CO₃. The sample were prepared in triplicates for each analysis, Blank was simultaneously prepared, containing 0.5 ml methanol, 2.5 ml 10% Folin-Ciocalteu’s reagent dissolved in water and 2 ml of 7.5% of Na₂CO₃, the same procedure was repeated for the standard solution of Gallic acid without sample to construct the calibration curve. The samples were thereafter incubated in a thermostat at 45°C for 45 min.

<table>
<thead>
<tr>
<th>Gallic acid in microliter</th>
<th>Methanol in microliter</th>
<th>Concentration in µg/ml</th>
<th>FC in ml</th>
<th>7.5% SC in ml</th>
<th>Absorbance at 760 nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.25</td>
<td>468.75</td>
<td>31.25</td>
<td>2.5</td>
<td>2</td>
<td>1.211</td>
</tr>
<tr>
<td>62.5</td>
<td>437.5</td>
<td>62.5</td>
<td>2.5</td>
<td>2</td>
<td>1.342</td>
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<tr>
<td>125</td>
<td>375</td>
<td>125</td>
<td>2.5</td>
<td>2</td>
<td>1.455</td>
</tr>
<tr>
<td>250</td>
<td>250</td>
<td>250</td>
<td>2.5</td>
<td>2</td>
<td>1.821</td>
</tr>
<tr>
<td>500</td>
<td>0</td>
<td>500</td>
<td>2.5</td>
<td>2</td>
<td>2.455</td>
</tr>
<tr>
<td>Sample</td>
<td></td>
<td></td>
<td>2.5</td>
<td>2</td>
<td>1.215</td>
</tr>
</tbody>
</table>

Incubated at 45°C for 45 min.
Table 4: Standard Gallic Acid Curve

spectrophotometer at \( \lambda_{\text{max}} = 760 \) nm. Based on the measured absorbance, the concentration of phenolics was read (mg/ml) from the calibration line then the content of phenolics in extracts was expressed in terms of gallic acid equivalent (mg of GA/g of extract).

**Determination of Total Flavonoids:**

Total flavonoid content: The total flavonoid concentration was measured using a Spectrophotometric assay using Rutin as standard. In a test tube, 0.50 mL methanolic extract was mixed with 2.0 mL distilled water and 0.3 mL 5% (w/v) NaNO\(_2\). After standing the solution for 5 minutes, 0.3 mL of 10% AlCl\(_3\) was mixed in thoroughly and allowed to stand for 1 min. Lastly, 1.0 mL 1.0 M NaOH was added to the solution, absorbance was read at 510 nm. The total flavonoid contents of the samples were expressed in mg/g of Rutin equivalents.

<table>
<thead>
<tr>
<th>Rutin in ml</th>
<th>Distilled water in ml</th>
<th>Concentration in mg/ml</th>
<th>5% NaNO(_2) in ml</th>
<th>Stand the solution for 5 min</th>
<th>10% AlCl(_3) in ml</th>
<th>Mix thoroughly and allow to stand for 1 min</th>
<th>1M NaOH in ml</th>
<th>Absorbance at 510 nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
<td>2</td>
<td>40</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>1</td>
<td></td>
<td>2.1952</td>
</tr>
<tr>
<td>0.6</td>
<td>2</td>
<td>60</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>1</td>
<td></td>
<td>2.2951</td>
</tr>
<tr>
<td>0.8</td>
<td>2</td>
<td>80</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>1</td>
<td></td>
<td>2.4211</td>
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<tr>
<td>1.0</td>
<td>2</td>
<td>100</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>1</td>
<td></td>
<td>2.5502</td>
</tr>
<tr>
<td>1.2</td>
<td>2</td>
<td>120</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>1</td>
<td></td>
<td>2.6101</td>
</tr>
<tr>
<td>Sample</td>
<td>2</td>
<td></td>
<td>0.3</td>
<td>0.3</td>
<td>1</td>
<td>1.997</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Standard Rutin Curve

The absorbance was determined using spectrophotometer at \( \lambda_{\text{max}} = 510 \) nm. Based on the measured absorbance, the concentration of Flavonoids was read in (mg/ml) from the calibration line then the content of Flavonoids in extracts was expressed in terms of mg/g Rutin equivalent.

The Folinciocalteus reagent is expressed in terms of Gallic acid equivalent (the standard curve equation \( y = 0.0026x – 1.1484 \) \( R^2 = 0.998 \)) the values obtained for the concentration of total phenols are expressed as mg GA per gm of extract.

<table>
<thead>
<tr>
<th>Extract</th>
<th>mg of GA/g of extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>25.61</td>
</tr>
</tbody>
</table>

Results:

**Total Phenols:**

Ethanol extract were prepared to examine the total phenolic content. The total phenolic content in the examined plant extract using the Folinciocalteus reagent is expressed in terms of Gallic acid equivalent (the standard curve equation \( y = 0.0026x – 1.1484 \) \( R^2 = 0.998 \)) the values obtained for the concentration of total phenols are expressed as mg GA per gm of extract.
equivalent of (mg of GA/g of extract).

**Figure 1:** Calibration curve of Gallic acid

**Total Flavonoids:**
Ethanol extract were prepared to examine the total flavonoid content. The total flavonoid content in the examined plant extract using the Folinciocalteus reagent is expressed in terms of Rutin equivalent (the standard curve equation $y = 0.0054x - 1.9804$ $R^2 = 0.998$) the values obtained for the concentration of total flavonoids are expressed as mg/gmRutin equivalent.

<table>
<thead>
<tr>
<th>Extract</th>
<th>mg/g of Rutin equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>3.07</td>
</tr>
</tbody>
</table>

Table 7 : Total flavonoids content in the plant extract expressed in terms of mg/g of Rutin equivalence.

**Figure 2:** Calibration curve of Rutin

**Conclusion:**
In summary, date palm fruits are known for their high food values and their medicinal uses. The qualitative analysis of date palm shows the presence of following phytochemicals in Aqueous extract carbohydrates, phenols, flavonoids, steriods, alkaloids, proteins and amino acids were observed. In alcholonic extract phenols, flavonoids, alkaloids, protein and amino acids, glycosides were observed. In Inorganic qualitative analysis sodium, iron, sulphate were appreciate. The date palm fruit contains high concentration of phenols and flavonoids compound.

In quantitative analysis. High concentration of phenols was observed in date palm fruit 25.61mg of GA/g equivalent.

Moderate concentration of flavonoids were observed in date palm fruit 3.07mg/g of Rutin equivalent. Which contribute to the promising antioxidant activities.

**References:**
1. Ibrahim A.Alhaider, Maged E. Mohamed, K.K.M.Ahmed,and Arun H.S.Kumar, Date palm (Pheonixdactylifera) Fruits as a potential cardio protective agent: The role of circulating progenitor cell; Frontier in Pharmacology;Sep 2017,vol 8.P.1-9.