Short communication

Preliminary pharmacognostic evaluation and volatile constituent analysis of spathe of *Phoenix dactylifera* L. (Tarooneh)

Azadeh Hamedi a,*, Abdolali Mohagheghzadeh b, Samaneh Rivaz c

a Department of Pharmacognosy, School of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran
b Department of Traditional Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran
c Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran

**Abstract**

**Background:** Spathe of date palm (which is called Tarooneh by Persian folk) and its aroma water is widely used in Persian traditional medicine but according to best of our knowledge lack is done on its chemical composition or standardization of the herb for its quality control in herbal market.

**Methods and material:** In this study microscopical and preliminary pharmacognostic properties of fractions obtained from date palm spathe (Tarooneh) were screened by thin layer chromatography. In addition, essential oils of the spathe were analyzed by GC–MS spectroscopy.

**Results:** Different fractions of the spathe contain steroids, triterpene steroids, oils and flavonoids in different amount. Fourteen compounds accounting for 93% of the oil were identified by GC–MS analysis. Oxygen containing monoterpenes were the main class of components (73%) with carvacrol (37%), linalool (24%) and thymol (10%) as major constituents of the oil.

**Conclusion:** Volatile constituents and preliminary pharmacognostic evaluation of Tarooneh can give some useful data for further phytochemical analysis, quality control and standardization of Tarooneh.

---

**1. Introduction**

*Phoenix dactylifera* L. (Arecaceae) is widely cultivated in Middle East and America for nutritional values of its fruits which are rich in carbohydrates and tannins. In Persian traditional medicine the fruits are used as detersive, vermicide, astringent, febrifuge and aphrodisiac. Also, the spathe which is called Tarooneh and its aroma water are used as sedative, tranquilizer, nerve tonic and for rheumatoid arthritis. Palm spathe is a large bract that forms a sheath to enclose the flower cluster of the palm. According to the best of our knowledge there is not any report on pharmacognostic properties or chemical constituents of the spathe or its aroma water.

**2. Materials and methods**

Spathe of the *P. dactylifera* L. (Tarooneh) was purchased from Shiraz herbal market and authenticated by Miss Sedigheh Khademyan, Taxonomist, Department of Pharmacognosy, Shiraz School of Pharmacy and the voucher specimen was preserved with the code PM-172 in the department for further references. The plant material was powdered, passed through sieve number 100 and kept in dark closed container.

---

*Corresponding author. Tel.: +98 711 2424127.*

**E-mail addresses:** hamediaz@sums.ac.ir (A. Hamedi), mohaghegh@sums.ac.ir (A. Mohagheghzadeh), aseman_flame@yahoo.com (S. Rivaz).

**Article info**

**Article history:**
Received 11 January 2013
Accepted 28 February 2013
Available online 6 March 2013

**Keywords:**
Date palm
GC–MS
Phytochemical screening
Spathe
Volatile oil

---

Copyright © 2013, Phcog.Net, Published by Reed Elsevier India Pvt. Ltd. All rights reserved.
2.3. Thin layer chromatography

Solutions of 5 mg/ml of different fractions were prepared and 10 μl of them were applied with HPTLC (CAMAG) to the silica gel plate 60F254 (10 × 20 cm) from Merck. The plates were run in non-polar (toluene: acetone, 80:20), semi-polar (toluene: chloroform: acetone, 40:25:35) and polar (n-butanol: glacial acetic acid: water, 50:10:40) mobile phases. Chromatographic spots were visualized first using ultraviolet lamps emitting at 254 and 365 nm and then using different spray reagents.6,7 For detection of essential oils and fatty acids phosphomolybdic acid reagent (vis.) and for alkaloids, Dragendorff reagent was applied. Also, 5% potassium hydroxide for coumarins (UV365 nm) and anthraquinones (vis. & UV365 nm), orcinol for glycosides, NP (Ethanolamine diphenylborate)/PEG for flavonoids (UV365 nm), Liebermann–Burchard for steroids and triterpenes, 3% FeCl3 for tannins and other phenolic compounds (vis.), vanillin-sulfuric acid and anisaldehyde-sulfuric acid as general reagents were sprayed on thin layer chromatography (TLC) plates.6,7 All chemicals and solvents were of analytical grade purchased from Merck or Sigma Aldrich.

2.4. Analysis of the volatile constituents

The volatile oil was extracted for 3 h by hydrodistillation Clevenger-type apparatus. One milliliter of n-hexane was added to collect the volatile oil. The oil was dried over anhydrous sodium sulfate and n-hexane was vaporized under a stream of N2. The gas chromatograph–mass spectrometry (GC/MS) analysis was carried out using a Hewlett-Packard 6890. The gas chromatograph was equipped with an HP-5MS capillary column (phenylmethylsiloxane, 25 m, 0.25 mm i.d.). The oven temperature was programmed from 60 °C (4 min) to 250 °C at a rate of 3 °C/min and increased at a rate of 5 °C/min to 280 and held for 10 min. The carrier gas was helium with a flow rate of 1.2 ml/min. The mass spectrometer was operating in the EI mode at 70 eV. The interface temperature was 250 °C; mass range was 30–600 m/z. The Kovats index (KI) of components was calculated for all compounds using a homologous series of n-alkanes under the same operational conditions of analysis. Identification of components was based on a comparison of their KI and mass spectra with Wiley (275), Adams libraries spectra and Pherobase Kovats Index Database.8,9

3. Results and discussion

Microscopical features of the spathe, including thickened inner parenchyma (A), sclerenchyma (B) and a piece of spathe tissue containing elongated cells (C) is shown in Fig. 1. The extractive values of herbal drugs can be considered as a representative of different class of their chemical constituents. The extractive values of n-hexane, dichloromethane and ethanolic fractions were determined 0.76%, 0.20% and 0.70% respectively.

The classes of these secondary metabolites were screened by thin layer chromatography and a variety of chemical reagents. Some chemical of the spathe like essential oils could be detected under UV lamps without chemical treatments. The spy reagent used made a great knowledge of secondary metabolites of the plant spathe. The n-hexane fraction chromatographed in non-polar mobile phase revealed several blue spots with phosphomolybdic acid reagent which shows that the root contains several essential oils. With Liebermann-Burchard reagent saponin and steroidal components in n-hexane and dichloromethane fractions of the spathe which were chromatographed in non-polar and semi-polar mobile phases appeared as brown zone in visible light and green florescent under UV365 nm (Fig. 2). Tannins gave faded red-brown zones. Alkaloids in the petroleum ether fraction which was run in non-polar solvent gave red-orange color with Dragendorff reagent. Polyphenols gave blue spots with FeCl3 reagent in ethanol fraction. According to best of our knowledge there is not any report on essential oils, polyphenols, saponin or steroidal constituents of spathe of P. dactylifera. Ardekani et al reported the presence of phenolic components in 14 different varieties of Iranian date palm (P. dactylifera L., Arecaceae) seed extract. Different amount of polyphenols,10,11 several tannins,12,13 flavonoids and procyanidin oligomers such as luteolin, quercetin, and apigenin have been identified in extracts of date fruits.14 In 2005, Mansouri et al studied phenolic profile of different varieties of ripe date palm fruit and detected p-coumaric, ferulic, sinapic acids, cinnamic acid derivatives and isomers of 5-o-cafeoylshikimic acid. They also identified different types of flavonoids, mainly flavones, flavanones and flavonol glycosides.15 The presence of estradiol, estriol, estrone and some novel flavonoids was reported from date palm pollen by Abbas and Ateya in 2011.16 Estrone and cholesterol have been detected also by Reymond et al from date palm seeds and pollen.17 Photochemistry and secondary metabolites of date palm fruits,

---

Fig. 1. Microscopical features of spathe of P. dactylifera L., A: thickened inner parenchyma (×10), B: sclerenchyma (×10) and C: a piece of spathe tissue containing elongated cells (×10).
seeds and pollen have been reviewed in several articles\textsuperscript{18,19} and books.\textsuperscript{20,21}

The volatile oils of the spathe, mostly miscible in water were trapped in hexane and gave a colorless solution with characteristic odor. With GC–MS analysis of the oil, 12 compounds were identified which represented about 92.86% of the total detected constituents. The identified compounds, their percentage and KI are summarized in Table 1. The main class of the compounds was found to be monoterpene hydrocarbons (0.52%), oxygen containing monoterpenes (73.76%), sesquiterpene hydrocarbons (6.07%) and oxygen containing sesquiterpenes (7.55%).

Carvacrol (35.45%) and linalool (24.10%) were the major components. Other compounds (up 2%) were thymol (10.93%), spathulenol (7.55%), beta-caryophyllene (4.33%), 3, 4 dimethoxytoluene (4.33%) and carvacrol methyl ether (2.44%). In 2011, Amira et al reported a low percentage of linalool (0.80 and 0.40%) in Degla cultivar of date fruit.\textsuperscript{22} Also the percentage of 4-terpineol in Horra and Gosbi cultivars of date fruit was almost similar to this work (0.10–1.20%). In another report the principal volatile oils of the fruits were identified as ethyl acetate, acetaldehyde, isopropyl acetate, \(\delta\)-valerolactone, octanal, furfuryl alcohol, 5-methyl furfural, linalool, \(\delta\)-valerolactone and \(\gamma\)-undecalactone.\textsuperscript{23}

Seeds which are rich in oleic acid, lauric acid, phenolics and tocopherol\textsuperscript{24,25} have been reported for antioxidant activity.\textsuperscript{26,27} Also, extracts of leaves and pits of \textit{P. dactylifera} exhibited antifungal and antiviral properties.\textsuperscript{28,29} Azmat et al analyzed hexane extract of seeds and leaves of \textit{P. dactylifera} and reported that the leaves extract contains fatty acid ethyl ester but fatty acid methyl esters along with steroids and terpenoids were mostly identified in seeds extract\textsuperscript{30}

4. Conclusion

Different fractions of date palm spathe contain steroids, triterpene steroids, oils and flavonoids in different amount. Oxygen containing monoterpenes were the main class of components with carvacrol, linalool and thymol as major constituents of the oil. In this study pharmacognostic characteristic and volatile constituents of Tarooneh were determined successfully which can give some guideline for further phytochemical analysis in future and also useful data for quality control and standardization of Tarooneh aroma water which is sold commonly in herbal markets.

**Conflicts of interest**

All authors have none to declare.

**Acknowledgments**

The present article was extracted from Pharm. D. thesis written by Samaneh Rivaz and was financially supported by Meymand Medicinal Plant Research Center and Shiraz University of Medical Sciences grants no. 90-5768.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Volatile constituent of Tarooneh (spathe of \textit{P. dactylifera} L.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compound</td>
<td>Retention time (min.)</td>
</tr>
<tr>
<td>p-Methyl anisole</td>
<td>8.21</td>
</tr>
<tr>
<td>Epoxy linalool</td>
<td>10.22</td>
</tr>
<tr>
<td>Linalool</td>
<td>12.06</td>
</tr>
<tr>
<td>Terpineol-4</td>
<td>14.87</td>
</tr>
<tr>
<td>Carvacrol methyl ether</td>
<td>17.84</td>
</tr>
<tr>
<td>3,4 Dimethoxytoluene</td>
<td>18.09</td>
</tr>
<tr>
<td>Unknown</td>
<td>18.42</td>
</tr>
<tr>
<td>Thymol</td>
<td>20.81</td>
</tr>
<tr>
<td>Carvacrol</td>
<td>21.57</td>
</tr>
<tr>
<td>Unknown</td>
<td>21.88</td>
</tr>
<tr>
<td>Carvacrol acetate</td>
<td>23.64</td>
</tr>
<tr>
<td>Beta-caryophyllene</td>
<td>25.18</td>
</tr>
<tr>
<td>Aromadendrene</td>
<td>25.89</td>
</tr>
<tr>
<td>Alpha-humulene</td>
<td>26.49</td>
</tr>
<tr>
<td>Ledene</td>
<td>28.20</td>
</tr>
<tr>
<td>Spathulenol</td>
<td>31.71</td>
</tr>
<tr>
<td>Unknown</td>
<td>33.91</td>
</tr>
<tr>
<td>Unknown</td>
<td>43.80</td>
</tr>
</tbody>
</table>

Fig. 2. TLC fingerprints of n-hexane (H), dichloromethane (D) and ethanolic (E) fractions of spathe of \textit{P. dactylifera} run in semi-polar mobile phase. A: Under UV\textsubscript{365} lamp and without reagent treatment, B: treated with phosphomolybdic acid reagent and C: under UV\textsubscript{365} lamp after treatment with Liebermann–Burchard reagent.


