A systematic review of the analytical method identified phytomedicine and pharmacological potency of Rosa species with special attention on *Rosa centifolia*

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**Introduction**

The vast range of medicinal plants distributed around the world is highly remarkable. According to reports, around 70,000 plant species from the lower level of lichens to higher levels of trees have been proven to have the potential for treating various illnesses. Based on WHO, 21,000 medicinal plants are in use for various medical applications. The traditional herbal practitioners are even today known to follow the herbal medicine system in rural areas, approximately 2500 plants for treating basic illness which has been considered as one of the best methods in Indian medical practices. Herbal drugs are naturally rich sources of various secondary metabolites and novel pharmacologically active compounds to improve human health with fewer adverse effects. Phytochemical study Plants play an important source of bioactive molecules for the discovery of novel drugs. During the past few years, public interest in medicine obtained from plants has increased exponentially. According to the World Health Organization, 65%-80% of the mass population in developing countries due to lack of access to modern medicine depends basically on plants for primary healthcare needs. Roses are a rich source of Vitamin C and are used in the making of medicaments. It is a fact that there is no other alternative to rose oil present naturally nor has it been prepared by synthetic process. Rose plants are shrubby in appearance with long drooping canes and grayish-green leaves. The shrub is 6.15 cm to 3 meters in height. The flowers are round and bulbous in shape, with highly scented thin overlapping. The branches of the shrub are covered with closely straight prickles. For the production of rose oil two major species of rose are cultivated: *Rosa damascena* which is extensively grown in Bulgaria (70–80%), Turkey, Russia, India, and China. Secondly, *Rosa centifolia* is most commonly grown in Morocco, France, and Egypt. Rose flowers have various medicinal activities, antibacterial, astringent, tonic, and antioxidant effects used for mild inflammation. Due to its biological activities like immunosuppressive, antioxidant, anti-inflammatory, antiarthritic, analgesic, anti-diabetic, cardioprotective, antimicrobial, gastroprotect, and skin ameliorative effects used in the making of medicaments. It is a fact that there is no other alternative to rose oil present naturally nor has it been prepared by synthetic process. Rose plants are shrubby in appearance with long drooping canes and grayish-green leaves. The shrub is 6.15 cm to 3 meters in height. The flowers are round and bulbous in shape, with highly scented thin overlapping. The branches of the shrub are covered with closely straight prickles. For the production of rose oil two major species of rose are cultivated: *Rosa damascena* which is extensively grown in Bulgaria (70–80%), Turkey, Russia, India, and China. Secondly, *Rosa centifolia* is most commonly grown in Morocco, France, and Egypt. Rose flowers have various medicinal activities, antibacterial, astringent, tonic, and antioxidant effects used for mild inflammation. Due to its biological activities like immunosuppressive, antioxidant, anti-inflammatory, antiarthritic, analgesic, anti-diabetic, cardioprotective, antimicrobial, gastroprotect, and skin ameliorative effects used in the making of medicaments. It is a fact that there is no other alternative to rose oil present naturally nor has it been prepared by synthetic process. Rose plants are shrubby in appearance with long drooping canes and grayish-green leaves. The shrub is 6.15 cm to 3 meters in height. The flowers are round and bulbous in shape, with highly scented thin overlapping. The branches of the shrub are covered with closely straight prickles. For the production of rose oil two major species of rose are cultivated: *Rosa damascena* which is extensively grown in Bulgaria (70–80%), Turkey, Russia, India, and China. Secondly, *Rosa centifolia* is most commonly grown in Morocco, France, and Egypt. Rose flowers have various medicinal activities, antibacterial, astringent, tonic, and antioxidant effects used for mild inflammation. Due to its biological activities like immunosuppressive, antioxidant, anti-inflammatory, antiarthritic, analgesic, anti-diabetic, cardioprotective, antimicrobial, gastroprotect, and skin ameliorative effects used in the making of medicaments. It is a fact that there is no other alternative to rose oil present naturally nor has it been prepared by synthetic process.
Material and Method

This review work was conducted using a well-organized search of the available literature on the medicinal plant from the inception till the end of June 2022 to identify all published investigations on the selected plants. The searches were performed using various databases, including PubMed (http://www.ncbi.nlm.nih.gov/pubmed), Science Direct (http://www.sciencedirect.com/), Scopus (http://www.scopus.com/), and Google Scholar (http://www.scholar.google.com/). A literature review of Rosa species reveals the following information on analytical methods and pharmacological potency.

Results

In this study, the introductory databases search related to the rosa species has recognized about “70” publications. Analytical work studies were reviewed outlined in Tables 1, 2, 3, 4, 5, 6 and 7 respectively, in vitro experiments and animal studies were also reviewed. Together pharmacological activity of Rosa species is discussed in a descriptive manner. It was found that research studies conducted on rosa species mostly focused on their flower part, and only a few studies have been reviewed on the other parts of the plant. There are no human trials or any other type of clinical trial reported.

Therapeutic chemical reported in Rosa centifolia

Table 1: Bioactive compound identified in Rosa centifolia by HPLC

<table>
<thead>
<tr>
<th>First author/year</th>
<th>Plant name (species name)</th>
<th>Plant part studied</th>
<th>Type of extract (sample)</th>
<th>Technique used</th>
<th>Phytochemical identified</th>
<th>Therapeutic activity</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camille Dubois et Al., 2022</td>
<td>R. centifolia</td>
<td>Stem</td>
<td>Hydroalcoholic extract</td>
<td>HPLC-DAD/ELSD</td>
<td>The three major compounds, isoquercitrin, quercitrin and euscaphic acid found, never identified in R. centifolia previously.</td>
<td>Antioxidant Activities, anti-inflammatory potential. Anti-hyaluronidase and its interesting anti-elastase activity.</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 2: Bioactive compound identified in Rosa centifolia by GC coupled technique

<table>
<thead>
<tr>
<th>First author/year</th>
<th>Plant name (species name)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Jdzef Gdra, Anna Lis* and Danuta Kalemba, 1995</td>
<td>Rosa centifolia L</td>
<td>Fresh petals</td>
<td>Hydrodistilled</td>
<td>GC and GC/ MS analysis columns: 30 m x0.32 mm, DB-17,30 m x0.32 mm, DB-Wax, carrier gas: nitrogen</td>
<td>Mainly geraniol (26.70%), citronellol (22.90%) and nerol (14.26%).</td>
<td>Not mentioned</td>
<td>11</td>
</tr>
<tr>
<td>M. khalid Shabbir et al, 2009</td>
<td>Rosa centifolia L</td>
<td>Fresh petals</td>
<td>Petroleum ether extract (concentrated oil)</td>
<td>High resolution gas liquid chromatographic (HR-GLC) analysis Column: SP2330 (30m×0.32mm), carrier gas: pure nitrogen</td>
<td>Geraniol, Linalool, Phenylethyl alcohol, Benzaldehyde, Citronellyl acetate, Benzyl alcohol, Geranyl acetate.</td>
<td>Not mentioned</td>
<td>12</td>
</tr>
<tr>
<td>M. Aslam Khan and Shoaib-ur-Rehman, 2005</td>
<td>Rosa centifolia L</td>
<td>Flowers</td>
<td>Hexane extract/essential oil</td>
<td>Liquid gas chromatographic (LGC) analysis</td>
<td>Geraniol, Eugenol, Rhodinol, Citronellol, Linalool, Citranellyl acetate, Phenyl ethyl alcohol,</td>
<td>Not mentioned</td>
<td>13</td>
</tr>
</tbody>
</table>
The typical essential oil of Rose is Chemically, a mixture of almost 300 compounds such as terpene and phenol derivatives of hydrocarbon compounds. Rosa centifolia (province rose, cabbage rose or Rose de Mai) the important chemical constituents isolated from flower petals by gas chromatography analysis.

Therapeutic chemicals reported in other species of Rosa

We have found that only some of the species of rose have undergone detailed study in reference to their phytochemical and clinical parameter such as Rosa damascena, Rosa gallica, and R. canina, Rosa hybrida cv., Rosa sinensis and some other species.

Table 3: Bioactive compound identified in rosa species by HPLTC

<table>
<thead>
<tr>
<th>First author/year</th>
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<th>Therapeutic activity</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamanna Nazli et al., 2019</td>
<td><em>R.</em> damascene</td>
<td>Flowers</td>
<td>Chloroform extract &amp; ethanolic extract</td>
<td>HPTLC-densitometry analysis; Mobile phase: Toluene: Ethyl acetate 9:1 (v/v); Column: Silica gel 60F254</td>
<td>In chloroform extract: at Rf 0.13 (purple), 0.17 (pink), 0.23 (pinkish purple), 0.26, 0.30 (pink), 0.37 &amp; 0.44 (purple) under visible light. Ethanol extract: Under UV366nm, Rf 0.48 (dark blue).</td>
<td>Medicinal, cosmetic and aromatic properties</td>
<td>17</td>
</tr>
<tr>
<td>Osman Tuncay Ağar et al., 2017</td>
<td><em>R.</em> damascena</td>
<td>Petals</td>
<td>Extract prepared by using the solvents in different Polarity</td>
<td>HPTLC</td>
<td>kaempferol 3-O-β-D-glucopyranoside, quercetin 3-O-β-D-glucopyranoside, quercetin 3-O-β-D-galactopyranoside were reported</td>
<td>Anti-HIV, antibacterial, antioxidant, antitussive, hypnotic and antidiabetic</td>
<td>18</td>
</tr>
<tr>
<td>Ludivine Riffault et al., 2014 and 2016</td>
<td>Rosa <em>hybrida cv.</em> (Jardin de Granville)</td>
<td>Early buds, Buds, flowers, leaves, wood, shoot</td>
<td>EtOH/H2O 9/1 (v/v) extracts</td>
<td>HPTLC: Mobile phase: ACN/H2O/HCOOH: 50/50/5 (v/v/v), with Neu’s reagent Plate: Silica gel F254</td>
<td>Around 60 compounds were identified, mainly gallo-tannins, ellagi-tannins, catechin derivatives and glycoside derivatives of quercetin and kaempferol</td>
<td>Cosmetic purpose and Antiaging property</td>
<td>19,20</td>
</tr>
<tr>
<td>Kshipra Misra and Shoma Nandi, et al., 2013</td>
<td>Rosa sinensis</td>
<td>Rose petals and buds</td>
<td>Ethanol extract</td>
<td>HPTLC</td>
<td>Gallic acid 12.76 mg / g The Rf value of gallic acid was found to be 0.29</td>
<td>Antioxidant activity</td>
<td>21</td>
</tr>
</tbody>
</table>
Table 4: Bioactive compound identified in rosa species by HPLC

<table>
<thead>
<tr>
<th>First author/year</th>
<th>Plant name (species name)</th>
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<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y. S. Velioglut and G. Mama’, 1991</td>
<td><em>Rosa damascena</em> Mill</td>
<td>Petales</td>
<td>Ethanol-acetic acid-water extract (10:1:9)</td>
<td>HPLC Ultrapac prepared column (250 X 4.6 mm) of Spheri 10-RP18 (10 pm) solvent A, formic acid-water (595 v/v), solvent B, methanol; elution profile 0-10 min, 17-22% B (linear gradient) 190-370 nm.</td>
<td>The main anthocyanin was cyanidin 3,5-diglucoside, which accounted for over 95% of the total anthocyanins. Also identified were several kaempferol and quercetin glucosides, galactosides, arabinosides, and rhamnosides. Total anthocyanins was 285 mg/kg of fresh petals.</td>
<td>Antiradical activity.</td>
<td>22</td>
</tr>
<tr>
<td>N. Demir et al, 2013</td>
<td><em>Rosa canina</em>, <em>Rosa dumalis</em>, <em>Rosa gallica</em>, <em>Rosa dumalis subsp.boissieri</em> and <em>Rosa hirtissima</em></td>
<td>Rosehip</td>
<td>Methanol/water/formic acid (50:48.5:1.5) extract</td>
<td>RP-HPLC-DAD mobile phase: (A) water/acetic acid (98:2) and (B) water/acetonitrile/acetic acid (78:20:2). Column: C18 (250 _ 6 mm LD.) λ = 280, 320 and 360 nm. SPME/GCeMS Column: DB-Wax column (60 m _ 0.25 mm _ 0.25 mm; J&amp;W Scientific, Folsom, CA, USA) Carrier gas: He</td>
<td>Rosehip fruits are characterized by high levels of ascorbic acid and the sample of RG contained about 160.30 mg/100 g dry weight. The levels of ascorbic acid in other samples ranged from 65.75 to 136.14 mg/100 g which is noteworthy. Rosehips were also rich in some phenolic compounds including gallic acid, catechin, procyanidin-B2, chlorogenic, t-cafeic, p-coumaric, ferulic, and sinapic acids.</td>
<td>Antioxidant activity</td>
<td>23</td>
</tr>
<tr>
<td>Vlasta Cunja et al., 2014</td>
<td><em>R. canina</em>, <em>R. glauco</em>, <em>R. rubiginosa</em>, <em>R. sempervirens</em></td>
<td>Petal and Leaf</td>
<td>Ethanol extract</td>
<td>High-performance liquid chromatography/mass spectrometry</td>
<td>Leaves contain seven different anthocyanins and 31 flavonols in petals; 30 flavonols, 14 phenolic acids, and their derivatives; 15 flavonols; and 20 hydrolysable tannins</td>
<td>Not mention</td>
<td>24</td>
</tr>
<tr>
<td>Nilgun Gokturk Baydar et al, 2013</td>
<td><em>Rosa damascena</em> Mill</td>
<td>Fresh and spent flowers, and green leaves</td>
<td>Methanol extract</td>
<td>HPLC Mobile phase: solvent A contained 3% acetic acid in water and solvent B</td>
<td>Gallic acid in the flower extracts, and (+)-catechin and (-)-epicatechin in the leaf extract were the most abundant</td>
<td>Antioxidant and antiradical properties</td>
<td>25</td>
</tr>
</tbody>
</table>
contained methanol
Column: Eclipse XB C-18 column
(5 µm, 4.6 mm × 250 mm, Wallborn, Germany)
phenolic compounds. Leaf extracts exhibited more antiradical activity at a concentration of 50 µg/ml

| Poonam Kumari et al., 2018 | *Rosa hybrida* L. | Rose petal | Methanolic extract | HPLC Mobile phase: solvent A: water (0.1% formic acid) and solvent B: acetonitrile (0.1% formic acid). Column: C-18 column λ = 280 nm. Presence of five major phenolic compounds in rose petal extract, *viz.* quercetin, catechin, epicatechin, rutin and 3-hydroxy cinnamic acid. | Health-promoting properties |
| Shahla Shameh et al., 2018 | *R. foetida* Herrm, *R. hemisphaerica Herrm*, *R. webbiana Wall. ex Royle*, *R. × damascena Herrm*, *R. canina L.*, *R. moschata Herrm*; | Fresh flowers | Methanolic extract | HPLC 1% aqueous acetic acid solution (solvent A) and acetonitrile (solvent B).
250 nm (quercetin and chlorogenic acid), 272 nm (gallic acid, cinnamic acid, and apigenin), and 310 nm (caffeic acid, rutin, and *p*-coumaric acid), respectively
Column: (250 mm × 4.6 mm, C18, ZORBAX Eclipse XDB) λ = 250, 272 and 310 nm.
The amounts of phenolic acids varied in the studied species in this order: gallic acid from 22.71 to 38.54 µg/g DW, caffeic acid from 1.50 to 64.18 µg/g DW, chlorogenic acid from 24.37 to 135.22 µg/g DW, *p*-coumaric acid from 20.68 to 647.28 µg/g DW, and cinnamic acid from 0.136 to 0.360 µg/g DW. quercetin, catechin, epicatechin, rutin and 3-hydroxy cinnamic acid |
|  |  |  |  | Antioxidant activity |

Table 5: Bioactive compound identified in rosa species by UPLC

<table>
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<tr>
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<th>Plant part studied</th>
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<th>Therapeutic activity</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrzej Cendrowski et al., 2017</td>
<td><em>Rosa rugosa</em></td>
<td>petals</td>
<td>Ethanolic extract</td>
<td>UPLC-photodiode detector-quadrupole/time of flight-mass spectrometry (UPLC-PDA-Q/TOF-MS) UPLC BEH C18 column (1.7 _m, 2.1 mm _ 100 mm consisted of solvent A (2.0% formic acid, v/v) and solvent B (100% of acetonitrile) Wavelength: ellagitannins at 254 nm, flavan-3-ols at 280 nm, phenolics at 320 nm and flavonol glycosides at 360 nm.</td>
<td>Phenolic acids, flavonols, flavan-3-ols and hydrolisable tannins (gallotannins and ellagittannins). R. rugosa petals contains up to 2175.43 mg polyphenols per 100 g fresh weight, therein 1517.01 mg ellagitannins per 100 g fresh weight were found.</td>
<td>Valuable raw material for the food industries</td>
<td></td>
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</table>

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Table 6: Phytochemical reported in Rosa centifolia by MS coupled technique

<table>
<thead>
<tr>
<th>First author/year</th>
<th>Plant name (species name)</th>
<th>Plant part studied</th>
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<th>Therapeutic activity</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Tania C.S.P. Pires et al., 2018</td>
<td>Rosa damascena, R. gallica and R. canina</td>
<td>Dry petals</td>
<td>Hydro methanolic extracts</td>
<td>LC-DAD-ESI/MSn (Dionex Ultimate 3000 UPLC, Thermo Scientific, San Jose, CA, USA)</td>
<td>Quercetin-kaempferoglucuronide A, Kaempferol-rhamnoside A, Quercetin-(p-coumaroyl) Hexoside A</td>
<td>Antioxidant, antiproliferative, and antibacterial</td>
<td>29</td>
</tr>
<tr>
<td>A. Maciag and D. Kalemba, 2014</td>
<td>Rosa rugosa</td>
<td>Dry petals</td>
<td>Aqueous extract</td>
<td>Gas chromatography coupled with mass 111 spectrometry (GC–FID–MS). non-114 polar capillary column Rtx 1ms (60 m, 0.25 mm, 0.25 m film thickness), carrier gas – helium</td>
<td>b-Phenylethanol, citronellol, geraniol, and nerol were the main volatile constituents of primary hydrolate. b-Phenylethanol, citronelic acid, and geranic acid were the main volatile constituents of secondary hydrolate</td>
<td>Not mentioned</td>
<td>30</td>
</tr>
<tr>
<td>Zeinab Alizadeh and Mohammad Fattahi, 2021</td>
<td>Rosa damascene</td>
<td>Fresh flowers</td>
<td>Methanolic extract</td>
<td>GC/MS analysis Column: silica capillary column (30 m × 0.250 mm, 0.25 μm film thickness) carrier gas: helium</td>
<td>Geraniol, citral, methyl linoleate, n-heneicosane, and n-octane were the major components of essential oils. Carotenoid content ranged from 0.002 to 0.055 mg/g DW</td>
<td>Antioxidant activities</td>
<td>31</td>
</tr>
<tr>
<td>Tsanaktsidis C.G. et al., 2012</td>
<td>R. damascene</td>
<td>Rose flower</td>
<td>Aqueous extract</td>
<td>Gas Chromatograph – Mass Spectrograph (GC–MS) Column: HP-5MS Carrier Gas: He</td>
<td>2-phenethyl alcohol, citronellol, nerol, and geraniol, and 59 other detectable aromatic components</td>
<td>Not mentioned</td>
<td>32</td>
</tr>
<tr>
<td>Yi-zhong Cai et al., 2005</td>
<td>Rosa chinensis</td>
<td>Flowers</td>
<td>Methanolic extract</td>
<td>Liquid chromatography–mass spectrometry (LC–MS)</td>
<td>Total of 36 known and unknown phenolics were identified quercetin/kaempferol mono- and diglycosides, and cyanidin</td>
<td>Antioxidant power</td>
<td>33</td>
</tr>
<tr>
<td>Daniela Nedeltcheva-Antonova et al.,</td>
<td>Rosa damascena Mill.</td>
<td>Not mention</td>
<td>Derivatized product</td>
<td>GC/MS Two fused silica capillary columns (J &amp;W Scientific, Folsom, CA) Helium (99.99%) was used as a carrier gas</td>
<td>132 compounds, mainly mono- and sesquiterpenoids were identified. The main constituents, representing 80.0–95.5% of the total content of the detected compounds.</td>
<td>Not mentioned</td>
<td>34</td>
</tr>
<tr>
<td>Authors</td>
<td>Cultivar</td>
<td>Sample Type</td>
<td>Extraction Method</td>
<td>Solvent</td>
<td>HPLC and LC-MS Conditions</td>
<td>Identified Compounds</td>
<td>Notes</td>
</tr>
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</tr>
<tr>
<td>Huihua Wan et al., 2019</td>
<td>'Yellow Island' and 'Garden City', Yunzheng Xiawei', 'Wangqiqinghuai' and 'Pink Fan' (PF), and 'Chacok' (CH)</td>
<td>Powdered flower</td>
<td>Various solvent used for the extraction</td>
<td></td>
<td>HPLC and LC-MS $\lambda = 520$ nm for anthocyanin and 350 nm for flavonols.</td>
<td>Four anthocyanins, 20 flavonols, and 10 carotenoids were detected in petals of tested cultivars. Major individual anthocyanin, flavonol, and carotenoid were cyanidin/pelargonidin 3,5-diglucoside, kaempferol 3-O-rhamnoside, and (9Z)-violaxanthin, respectively.</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Mounia Chroho et al., 2022</td>
<td><em>Rosa damascena</em></td>
<td>Flowers</td>
<td>Hydroethanolic</td>
<td></td>
<td>HPLC-MS RP C18 column Mobile phase: 0.1% of formic acid in water (A), and acetonitrile (B) $\lambda = 200–400$ nm</td>
<td>Vakonic acid dilactone and ellagic acid were identified. Ellagi tannins are hydrolysable tannins formed from gallic acid esterified with hexahydroxydiphenic acid (HHDP) Flavonoids: Quercetin and kaempferol</td>
<td>antiviral, bacteriostatic effect, antioxidant, anticancer, and anti-inflammatory activities</td>
</tr>
<tr>
<td>Tarek M. Galal et al., 2022</td>
<td><em>R. damascena</em> (Taif's rose)</td>
<td>Leaves and stems</td>
<td>Aqueous and methanolic extract</td>
<td></td>
<td>HPLC-MS system For Flavanoids, phenolic acid and alkaloid different solvent system used, column: RP18 $\lambda = 280$ nm, 325 &amp; 226 nm respectively</td>
<td>Tail’s rose contains flavonoid components: luteolin, apigenin, quercetin, rutin, kaempferol, and chrysosiriel; phenolics: ellagic acid, catechol, resorcinol, gallic acid, and phloroglucinol; alkaloids such as berbamine, jatrorrhizine, palmatine, reticuline, isocorydine, and boldine.</td>
<td>Antimicrobial</td>
</tr>
<tr>
<td>Marta Olech et al., 2020</td>
<td><em>Rosa rugosa</em> Thunb</td>
<td>Dry leaves</td>
<td>Methanolic extract</td>
<td></td>
<td>LC-MS/MS-MRM HPLC system: for phenolics Column: Eclipse XDB-C18 water-methanol and water-acetonitrile mobile phases for flavonoid column; Kinetex XB-C18 Mathnol: water-MeOH and water-ACN Gradients MS Nitrogen was used as a nebulizer and collision gas</td>
<td>The presence of a large amount of phenolic compounds was detected in rose leaves (786.44 _g/g and 14.46 _g/g of phenolic acids and flavonoid aglycones, respectively). Isoferulic acid and five aglycones were revealed for the first time in this plant material. Moreover, 15 phenolic acids and six aglycones were found in the rose achenes, including eight phenolic acids and four aglycones that had not been previously reported in this rose organ.</td>
<td>Potential commercial use in pharmaceutical, food, or cosmetic industry.</td>
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</tbody>
</table>

Table 7: Bioactive compound identified in rosa species by FTIR

<table>
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<tr>
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<tr>
<td>Mohammed Ali et al, 2016</td>
<td><em>R. damascene</em></td>
<td>Flowers</td>
<td>Methanolic extract</td>
<td>FT-IR spectrophotometer, UV spectrophotometer, 1H (300 MHz) and 13C (75 MHz) NMR spectrophotometer</td>
<td>Four new compounds identified as n-cosan-5β-ol (1), (cis)-6, 10, 14-trimethylpentadec-3-en-7β,11β-diol (damascene, 2), 7-hydroxy-4-(3'-methyl butanol)- coumarin-3-en-one (rosacoumarin, 3) and cedr-6-en-12-ol-14-oic acid (rosa cedrenoic acid, 4)</td>
<td>Abdominal and chest pains, menstrual bleeding, digestive problems.</td>
<td>39</td>
</tr>
</tbody>
</table>

Rosa gallica L., Rosa centifolia L., Rosa damascena Mill. was declared that the solid residue of extract contains mainly straight-chain saturated hydrocarbons with high molecular weight (C-15-C31) and the esters of carboxylic acids and a homologous series between them exist. The study showed phenolic and flavonoid content where Ascorbic Acid standard drugs. French city is known as the PERFUME CAPITAL of the world. *R. canina*, *R. gallica*, *R. rugosa*, Rosehip Aqueous and ethanolic extract evaluated for in vitro total antioxidant capacity. Rose (*Rosa spp.*) petals were evaluated the micro (Co, Cu, Fe, Mn, Ni and Zn), macro (Ca, Mg, Na and P) and toxic elements (As, Cd and Cr) of organically cultivated rose. The study concluded that rose petals are a promising potential nutritional supplement in the human diet. According to the analytical studies review some of the most important phytochemicals are mentioned. The structural presentation of the identified compound is shown in Fig. 1.
Singh et al. Journal of Drug Delivery & Therapeutics. 2023; 13(12):224-237

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Reported activity in Rosa centifolia

Antidiabetic activity

A. Thilagavathy et al., 2018; Bioassy guided fractionation study of hydroalcoholic extract of *Rosa centifolia* was performed in this study Flavonoids, proteins, and alkaloids are reported to be determined at 254 nm, 280 nm, and 418 nm respectively. 44.

Antihypercholesterolemic activity

This study aimed to investigate whether the hydroalcoholic extract of *Rosa centifolia* exhibited the maximum inhibition of the enzyme under analysis with a ratio of 1.4117. 45.

Nephrotoxicity activity

The ethanolic extract of petals of *R. centifolia* is effective in doxorubicin-induced nephrotoxicity in rats. The effect of the ethanolic extract on the petals of *R. centifolia* might be credited to its antioxidant properties 46.

Antitussive

In this study evaluated the anti-tussive potential of the ethanolic extract of "Rosa centifolia" in a sulfur dioxide gas-induced mouse model 47.

Anti-arthritic activity and anti-inflammatory activity

Battiwala Archana J et al., 2013; *Rosa centifolia* flowers aqueous extract Evaluated for anti-inflammatory and anti-arthritic activity in male albino rats 48. Another study was carried out to evaluate the anti-inflammatory and antiarthritic activity of aqueous extract of *Rosa centifolia* (RC) 49.

Antidepressant activity

The antidepressant activity with an aqueous extract of *Rosa centifolia* was investigated in the forced swim test and tail suspension test. The aqueous extract of *Rosa centifolia* has significant antidepressant activity at a high dose level (100 mg/kg) 50.

Antimicrobial activity

The Study was conducted to identify microbiota of *Rosa centifolia* that might be accountable for the loss of their actual fragrance. The starch hydrolysis and glucose fermentation tests performed for characterization involved endospore staining, catalase, and motility tests 51.

Antidiabetic activity

A completely different study was performed on dye extracted from *Rosa centifolia*. The dye sensitized solar cells based on ZnO nanorods show maximum photoelectric conversion efficiency of 0.76%. 52. According to the various scientific evidence, it is confirmed that various organs (flower petals, hips, leaf, steam) of the wild rose could be a rich source of antioxidants because of the high medicinally active secondary metabolites such as phenolic compositions and some well-known antioxidant compounds. Further analytical and preclinical studies are necessary to evaluate potentially active secondary metabolites of *Rosa centifolia*.

Activity reported in other species of *Rosa*

**Antidiabetic**

A review reported that in Iran, the Rosa damascena plant is commonly known as “Gole Mohammadi”. The antimicrobial, antioxidant, analgesic, anti-inflammatory, anti-diabetic, and anti-depressant properties have been confirmed 53. Cell proliferation and cytotoxicity assay (in-vitro) was performed on pancreatic b-cells, bTC6. The protective action of the crude extract on streptozotocin-induced death in bTC6 cells was evaluated 54. In this study, we evaluated the antidiabetic and antihyperglycemic activity of *Rosa canina* fruit extract in streptozotocin-induced diabetic rats 55. The processing method lowering was applied such as components of green tea polyphenols can be changed, the red rose flower determines whether the processed or non-processed rose flower has an anti-diabetic effect on the streptozotocin-induced diabetic mouse 56. The oligosaccharide from *Rosa canina* fruits was isolated and characterized by a combination of FTIR, NMR, and Mass spectrometry analysis. Wistar rats were used for diabetic study (type 2) 57. The methanolic extract of *Rosa damascena* Mill. Flowers were studied, in contrast to the acarbose (α-glucosidase inhibitor), in normal and diabetic rats 58. Rosa damascena Mill. Hydrosol effect study in streptozotocin (STZ)-induced diabetic rats, hematology, clinical biochemistry, lens enzymatic activity, and lens pathology were evaluated 59.

**Antioxidant**

This study, reveals that rose residue (Damasen rose (Rosa damascena) flower residue) is rich in phenolic content and has a noticeable antioxidative effect 60. The *in-vivo* method was used to evaluate the antioxidant capacity of hips collected from four rose species (Rosa co nina, R. corymbifera, R. micrantha, and R. sempervirens) 61. Rosa alba L. and *Rosa damascena* Mill
herbal plant phytochemical profile and antioxidant capacity of extract (hydroxyls), obtained by water-steam distillation method stated that Rosa damascena (white rose) methanolic extract from Iran shows antimicrobial activities, total phenolics content, antioxidant properties, and the blood sera Ferric Reducing Antioxidant Power (FRAP) of the crude extracts were determined using standard methods. Extracts of flower petals of roses antioxidant compounds and their antioxidant activity were studied. A natural antioxidant symbol of beauty and love is the rose (Rosa chinensis Jacq.). The purpose of this study was to know the secondary metabolic compounds and total antioxidant capacity of methanol extracts of rose flowers. The petals of the evaluated roses are excellent sources of nutritional compounds and antioxidants. Antioxidant capacity of was studied using samples from seven industrial-scale plantations (Kazanlak, Zelenikovo, Moskovets, Bratsigovo, Strelcha, Mirkoovo and Gurkovo) in Bulgaria for Rosa damascena petals and leaves, representing different climatic conditions, during two successive growing seasons (2009 and 2010). This pilot explorative study evaluated the changes in urinary phenolic excretion in healthy volunteers to whom different doses of phenolics from edible roses (Gourmet Roses™) have been added to a meal. In this work, the dried Rose petals were taken to analyse the nutritional value and antioxidant activity.

Antiviral and antimicrobial activity

Rose geranium (Pelargonium graveolens) and petals of rose (Rosa damascena) essential oils (EOs) and extracts have been shown to have antiviral and antimicrobial properties. Rose geranium (Pelargonium graveolens) and petals of rose (Rosa damascena) are excellent sources of naturally occurring secondary metabolic compounds and antioxidant, antiarthritic antitussive antiaging antimicrobial, antidiabetic and relaxant action on tracheal chains have been reported for this plant.

Conclusion

Rosa species with special consideration of Rosa centifolia it is concluded that this herbal drug carries various bioactive phytochemical and broad medical properties. Broad-spectrum phytopharmacological properties of Rosa species are established through analytical and pre-clinical studies, further human research is expected to evaluate and ensure its properties. Although Rosa species were found clinically active in antioxidant, antiarthritic antitussive antilaging antimicrobial, and antiviral, multiple literature reported noteworthy antiproliferative, anticholestramich and antidiabetic effects. In conclusion, there is considerable evidence available for the efficiency, potency and safety of Rosa species to use medicinally, however, it is suggested to conduct advanced study, confirmatory experiments and clinical trials with existing authenticated and standardized plant products.

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Conflict of interest

There is no conflict of interest.

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