Antioxidant Activities of Imino Chromene Derivatives with Even Alkyl tail: Synthesis and Characterisation

Madasamy Kumar, Veerappan Jeyachandran, Arumugam Sathamraja, Pandian Paulraj

Abstract: The reaction between substituted 4-hydroxybenzaldehyde, active methylene compounds iminochromene derivatives. Structures of the severe established upon the basis of IR,1HNMR,13CNMR,and MASS data. In vitro, antioxidants activities of these compounds against superoxide anion radical, nitric oxide radical, DPPH radical and hydrogen peroxide were evaluated and compared with standard natural antioxidants ascorbic acid.

Keywords: chromenes, imines, amines, antioxidants

I. INTRODUCTION

Multicomponent reactions (MCRS) are reactions where numerous reactants involved in single synthetic operation and give new compounds.1 This type of reactions avoids purification process and often wide variety of complex molecule in a single step, inturn it is very useful for saving solvent and reagents. Among many heterocyclic compounds, chromenes are very important due to its biological activity such as antioxidants,2 anticancer,anti-microbial, 3 anti-inflammatory,4 anti-HIV,5 and anti-tumor,6,7alzimer disease, 8,9antihypotensive10 and antileishmanial.9 There are many reports shown that synthesis of different chromene derivatives and its applications (Figure 1).11, 12, 13 A Knoevenagel condensation is the reaction between salicylaldehyde with active methylene compounds followed by intramolecular cyclisation to give imino derivatives. 14 As per reports, different products are obtained by control of a solvent,15 ratio of reagents and temperature16etc., Due to importance of these chromene derivatives, numerous green approaches17 have been developed under distinct conditions like thermal heating,18 microwave, ultrasonic,electrochemical, infrared, and solvent free conditions. We could not find many reports on variation of an alkyl side chain to see the effect on antioxidant properties of chromene derivatives. So we are motivated to synthesis imino and amino chromenes by taking alkylated aldehyde and malonitrile. Currently, many investigations are going on effect of free radicals in biological systems such as lipids, DNA and protein, also create many diseases like atherosclerosis, neurodegenerative disease, rheumatoid arthritis, age related disease, cancer initiation and tumor.19, 20, 21 It is necessary to keep a proper level of natural antioxidant such as vitamin E, C and glutathione in a biological system in order to avoid serious health problems.22, 23, 24 All these health problems are caused by action of free radical oxygen (ROS) and reactive nitrogen (RNS) species, commonly known as (RS)s.25, 26,[1]-[7]

II. EXPERIMENTAL METHOD AND TECHNIQUES

Experimental

All NMR spectra were recorded using Bruker (300MHz) spectrometer. JASCO-FTIR spectrometer (4000-400cm⁻¹) used for recording Infrared spectra. Electro spray ionization mass spectrometry (ESI-MS) analysis was performed in the negative ion mode on a liquid chromatography-ion trap mass spectrometer (LCQ Fleet, Thermo Fisher Instruments Limited,US). The DPPH radical scavenging action of the compounds was dignified rendering to the method of Blois.27 The assay of nitric oxide (NO), H₂O₂, (O₂⁻) scavenging activity was determined using the method available in literature.

III. RESULTS AND DISCUSSION

A. Antioxidant activities

In the present study, antioxidant potential of synthesized 3-cyano-2-imino-2H-chromen-7-yl 4-(alkyloxy)benzoate (6a-h) were studied using DPPH, NO',O₂', H₂O₂ radical scavenging [8]-[15]
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Table II. Antioxidant activity of chromene derivatives (6a-h)

<table>
<thead>
<tr>
<th>Sn</th>
<th>Entry</th>
<th>DPPH</th>
<th>NO•</th>
<th>O•</th>
<th>H2O2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vitamin C</td>
<td>52.52±0.11</td>
<td>55.00±0.12</td>
<td>52.06±0.16</td>
<td>43.00±0.65</td>
</tr>
<tr>
<td>2</td>
<td>6a</td>
<td>27.16±0.41</td>
<td>22.48±0.41</td>
<td>35.04±0.49</td>
<td>4.26±0.82</td>
</tr>
<tr>
<td>3</td>
<td>6b</td>
<td>27.95±0.32</td>
<td>27.02±0.93</td>
<td>31.96±0.38</td>
<td>35.67±0.15</td>
</tr>
<tr>
<td>4</td>
<td>6c</td>
<td>27.65±0.56</td>
<td>27.77±0.36</td>
<td>31.68±0.40</td>
<td>36.80±0.38</td>
</tr>
<tr>
<td>5</td>
<td>6d</td>
<td>28.75±0.18</td>
<td>27.37±0.92</td>
<td>28.90±0.11</td>
<td>33.17±0.54</td>
</tr>
<tr>
<td>6</td>
<td>6e</td>
<td>28.11±0.22</td>
<td>27.33±0.23</td>
<td>30.83±0.02</td>
<td>33.16±0.45</td>
</tr>
<tr>
<td>7</td>
<td>6f</td>
<td>30.65±0.38</td>
<td>27.82±0.53</td>
<td>29.70±0.63</td>
<td>37.06±0.43</td>
</tr>
<tr>
<td>8</td>
<td>6g</td>
<td>31.06±0.58</td>
<td>28.13±0.35</td>
<td>28.48±0.53</td>
<td>30.06±0.82</td>
</tr>
<tr>
<td>9</td>
<td>6h</td>
<td>31.64±0.45</td>
<td>33.72±0.18</td>
<td>27.94±0.13</td>
<td>26.89±0.22</td>
</tr>
</tbody>
</table>

The hydrogen donating ability of amines and imine groups in the series 5a-h and 6a-h might be responsible for their antioxidant properties. Better radical-scavenging activity is observed for 6a, 6h, 6b, 6c, 6f, and 6g. The decreasing orders of antioxidant activity were lower than IC50 values for Vitamin C.

**Fig.1**. Synthetic procedures for series 5 and 6

shown better DPPH scavenging activity than vitamin C with IC50 values of 27.16, 27.95, and 27.93 μM respectively. The DPPH assay revealed that all the derivatives were lower than IC50 values of Vitamin C. The superoxide anion radical scavenging activities of tested was found to be in the decreasing order of 6h, 6g, 6d, 6f, 6e, and Vitamin C.

**Fig.2.** Antioxidant activity of 6a-h in IC50 values

**IV. CONCLUSION**

A series of 3-cyano-2-imo-no-2H-chromene-7-yl 4-(allyloxy)benzoate have been synthesized. The structures were confirmed by 1H-NMR, 13C-NMR, FT-IR and mass spectroscopic techniques. The compounds exhibited excellent radical scavenging activities against super oxide anion radical, nitric oxide radical, DPPH radical and hydrogen peroxide. Among all the derivatives, 6a, 6c(DPPH), 6a, 6b (NO•), 6g, 6h (O2•−), 6h, 6f (H2O2) having better free radical scavenging ability. Based on the result, it is clear that these can be used as good antioxidant in the field of medicinal and food industry.

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