Medical research has uncovered the causes and modifiers of the major chronic diseases affecting humans worldwide. In particular, cardiovascular diseases with emphasis on coronary heart disease are a major problem with high mortality\(^1\)\(^-\)\(^3\). In addition, there are many types of cancer and fortunately the key aetiological factors have been identified\(^4\)\(^-\)\(^6\). In virtually all of these diseases, the underlying mechanisms depend on oxidative processes leading to products that display reactive properties, affecting specific molecular targets in the vascular system and cellular DNA as regards many kinds of cancer. Specially, high titres of LDL-cholesterol represent one risk factor for heart disease. This macromolecule undergoes oxidation to the corresponding oxy derivative, in the absence of protective antioxidants\(^7\)\(^-\)\(^8\). The majority of human cancers are caused by DNA-reactive genotoxic carcinogens, modifying the DNA of normal cells. Specific DNA adducts of many kinds of carcinogens have been identified. However, since the discovery by Kasai and Nishimura\(^9\) that DNA also can undergo oxidative modification, particularly the formation of 8-oxydG, it has been found that most chemical carcinogens not only form the conventional DNA adducts but also generate 8-oxydG\(^10\). In addition, promotion is involved in the growth and development of many forms of cancer. In turn, these processes involve active oxygen and peroxo compounds\(^11\). During the development and growth of many types of cancer there are distinct oxidation reactions that have been documented to play a key role during that phase of carcinogenesis. Indeed, these specific reactions involve the generation of active oxygen such as OH radicals and hydrogen peroxide that in turn control the cell duplication rates, and may affect apoptotic reactions that would lead to elimination of abnormal cells. Antioxidants antagonize powerfully the developmental aspects of carcinogenesis\(^12\)\(^-\)\(^13\).

Most of the phenolic antioxidants currently used in medicine (vitamin E, ubiquinone, probucol) belong to lipophilic compounds, while the number of known water-soluble drug forms is very restricted. However, the lipophilic character of phenolic antioxidants reduces the velocity of their transport in the organism and decreases penetration into tissues and cells, which can restrict the drug efficacy in urgent cases of free-radical pathologies such as ischemia reperfusion, radiation damage, acute

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**Abstract**

Microwave assisted synthesis of 2-Aminopyrimidine has advantages due to reduced reaction time, solvent-free condition and high yield. H-NMR spectrum shows a signal in the range of 5.1-5.3 ppm and IR spectrum show bands in the range 3456-3182 cm\(^{-1}\) due to the free amino group of compounds of 2-Amino-6-(4-methoxyphenyl)-4-(furan-2yl)pyrimidine, 2-Amino-6-[4-(dimethylamino) phenyl]-4-(furan-2yl)pyrimidine and 2-Amino-6-[3,4-(dimethoxy)phenyl]-4-furan-2ylpyrimidine.

**Keywords:** Free Amino Group, IR Spectrum, Signal, \(^1\)H NMR Spectrum

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**1. Introduction**

Medical research has uncovered the causes and modifiers of the major chronic diseases affecting humans worldwide. In particular, cardiovascular diseases with emphasis on coronary heart disease are a major problem with high mortality\(^1\)\(^-\)\(^3\). In addition, there are many types of cancer and fortunately the key aetiological factors have been identified\(^4\)\(^-\)\(^6\). In virtually all of these diseases, the underlying mechanisms depend on oxidative processes leading to products that display reactive properties, affecting specific molecular targets in the vascular system and cellular DNA as regards many kinds of cancer. Specially, high titres of LDL-cholesterol represent one risk factor for heart disease. This macromolecule undergoes oxidation to the corresponding oxy derivative, in the absence of protective antioxidants\(^7\)\(^-\)\(^8\). The majority of human cancers are caused by DNA-reactive genotoxic carcinogens, modifying the DNA of normal cells. Specific DNA adducts of many kinds of carcinogens have been identified. However, since the discovery by Kasai and Nishimura\(^9\) that DNA also can undergo oxidative modification, particularly the formation of 8-oxydG, it has been found that most chemical carcinogens not only form the conventional DNA adducts but also generate 8-oxydG\(^10\). In addition, promotion is involved in the growth and development of many forms of cancer. In turn, these processes involve active oxygen and peroxo compounds\(^11\). During the development and growth of many types of cancer there are distinct oxidation reactions that have been documented to play a key role during that phase of carcinogenesis. Indeed, these specific reactions involve the generation of active oxygen such as OH radicals and hydrogen peroxide that in turn control the cell duplication rates, and may affect apoptotic reactions that would lead to elimination of abnormal cells. Antioxidants antagonize powerfully the developmental aspects of carcinogenesis\(^12\)\(^-\)\(^13\).

Most of the phenolic antioxidants currently used in medicine (vitamin E, ubiquinone, probucol) belong to lipophilic compounds, while the number of known water-soluble drug forms is very restricted. However, the lipophilic character of phenolic antioxidants reduces the velocity of their transport in the organism and decreases penetration into tissues and cells, which can restrict the drug efficacy in urgent cases of free-radical pathologies such as ischemia reperfusion, radiation damage, acute
respiratory distress syndrome, or intoxication with hepatotropic poisons. Moreover, since the oxidation processes in living organisms proceed in both lipid (cell membranes, lipoproteins) and aqueous phases, the most effective approach consists in using a combination of fat- and water-soluble antioxidants.

Pyrimidine is a basic nucleus in nucleic acids and has been associated with a number of biological activities. Substituted pyrimidines and their derivatives are also well known to have a number of biological, antimicrobial and pharmaceutical activities.

2. Experiment

2.1 Preparation of Compounds

2.1.1 General Procedure for Preparation of 3-aryl-1-furan-2ylprop-2-en-1-one’s (1-3)

A mixture of appropriate benzaldehyde (0.01 mole), 2-furyl methyl ketone (0.01 mole) and sodium hydroxide pellets (0.05 mole) was finely powered in a pestle and mortar. The mixture was transferred into a 100 ml beaker and irradiated in the domestic microwave oven (LG Grill, MG395 WA). The mixture was irradiated at 320W for 30–40 seconds. Then, distilled water was added, the separated solid was collected in a Buckner – Funnel filtered and dried. The compound was recrystallized with suitable solvent. The following compounds were prepared by adopting the above general method.

- \(1\)-{(furan-2yl)-3- (4-methoxyphenyl) prop-2-en-1-one (1)
- \(3\)-[4- (dimethylamino) phenyl]-1- (furan-2yl) prop-2-en-1-one (2)
- \(3\)-[3,4- (dimethoxy) phenyl]-1- (furan-2yl) prop-2-en-1-one (3)

The molecular formula, melting point and yield are given in Table- 1

<table>
<thead>
<tr>
<th>Compound</th>
<th>Melting point (°C)</th>
<th>Yield %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>220 – 222</td>
<td>72.5</td>
</tr>
<tr>
<td>2</td>
<td>230 – 232</td>
<td>69.3</td>
</tr>
<tr>
<td>3</td>
<td>189 - 190</td>
<td>75.0</td>
</tr>
</tbody>
</table>

The formed 3-aryl-1-(furan-2yl) prop-2-en-1-ones were confirmed through FT - IR spectra. The FT - IR spectrum of 1, 2 and 3 are displayed in plates 1A, 2A and 3A. The FT - IR spectral data are given in Table 2.

2.1.2 Preparation of 2-amino-6-aryl-4-(2-furanyl) pyrimidines

A mixture of 3-aryl-1-furan-2ylprop-2-en-1-one (0.01 mole), guanidine hydrochloride (0.01 mole) and sodium hydroxide pellets (0.05 mole) was finely powered in a pestle and mortar. The mixture was transferred into a beaker and irradiated in the domestic microwave oven (LG Grill, MG395 WA). The mixture was irradiated at 320 W for 60-80 seconds. Then, distilled water was added to remove the excess of alkali and then filtered and dried. The product was separated from the reaction mixture by column chromatography using benzene and ethyl acetate mixture as eluting solvent. The following 2-aminopyrimidines were prepared by adopting the above general procedure.

- 2-Amino-6-(4-methoxyphenyl)-4-(furan-2yl) pyrimidine (1A)
- 2-Amino-6-[4-(dimethylamino)phenyl]-4-(furan-2yl)pyrimidine (2A)
- 2-Amino-6-[3,4-(dimethoxy)phenyl]-4-furan-2ylpyrimidine (3A)

Table 2. The irradiation time, yield and melting point of 1A, 2A and 3A

<table>
<thead>
<tr>
<th>Compound</th>
<th>Microwave irradiation Time(sec)</th>
<th>Microwave irradiation Yield %</th>
<th>Melting point (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>77</td>
<td>69.9</td>
<td>215-216</td>
</tr>
<tr>
<td>2A</td>
<td>65</td>
<td>80.5</td>
<td>187-188</td>
</tr>
<tr>
<td>3A</td>
<td>79</td>
<td>78.4</td>
<td>156-158</td>
</tr>
</tbody>
</table>

3. Synthesis

Some 2-amino-6-aryl-4-(furan-2yl) pyrimidines were obtained in two steps using microwave technique. First step involves Claisen-Schmidt condensation of 1-(2-firanyl)ethanone 1 with a suitably substituted benzaldehyde 2 in presence of sodium hydroxide to yield 3-Aryl-1-(2-furanly)prop-2-en-1-one (scheme-1).
Scheme 1.
As show in scheme-2, 3.1.2-amino-6-aryl-4-(furan-2yl) pyrimidines 1-3 were obtained by treatment of 1-3 with guanidine hydrochloride in presence of sodium hydroxide. These compounds were characterized using IR and NMR.

Scheme 2.
3.2.2-Amino-6 (4-methoxyphenyl) -4- (furan-2yl) pyrimidine (1A)

4. Result and Discussion

4.1 Analysis of $^1$H NMR Spectrum
The $^1$H NMR spectrum of 1 is given in plate 1A. The singlet for two protons at 5.14 ppm is assigned to the amino protons. The singlet for the H-5 proton is observed at 7.59 ppm. Other aromatic protons resonate in the region of 6.5 – 8.0 ppm. A singlet centered at 3.87 ppm is due to methoxy protons.

4.2 Analysis of $^1$H NMR Spectrum
The $^1$H NMR spectrum of 2 is given in plate 2A. The singlet for two protons at 5.07 ppm is assigned to the amino protons. The singlet for the H-5 proton is observed at 7.60 ppm. The aromatic protons resonate in the region of 6.5-8.0 ppm. The methyl protons of the dimethylamino group resonate at 3.04 ppm.

4.3 Analysis of $^1$H NMR Spectrum
The $^1$H NMR spectrum of 3 is given in plate 3A. The singlet for two protons at 5.28 ppm is assigned to the...
Microwave Synthesis of Amino-Pyrimidines - 1H NMR Spectrum

amino protons. The singlet for the H-5 proton is observed at 7.26 ppm. The aromatic protons resonate in the region of 6.50-7.69 ppm. The two singlets observed at 3.9 and 4.0 ppm are due to methoxy protons.

Figure 3.

5. Spectral Measurements

5.1 1H-NMR Spectra
Proton NMR spectra were recorded on BRUCKER AMX – 400 MHz or BRUCKER 200 MHz Spectrometer. Samples were prepared by dissolving about 10 mg of material in 0.5 ml of CDCl₃ containing 1% TMS. All the chemical shifts are referenced to TMS.

6. References