

## NOTE

## Synthesis of Substituted 3-Formyl Chromones

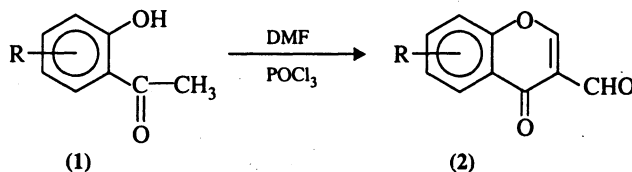
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Substituted 3-formyl chromones (2) have been synthesized through the cyclization of substituted 2-hydroxyacetophenones with dimethylformamide in the presence of  $\text{POCl}_3$ . Their structures have been characterized by elemental analysis and spectral data. These compounds were screened for antibacterial activity against *S. aureus* and *E. coli*.

**Key Words:** Synthesis, Substituted 3-formyl chromones, Antibacterial Studies.

2-Hydroxy acetophenones are convenient intermediate for the synthesis of 3-formyl chromones; they are found to possess considerable pharmacological properties<sup>1-3</sup>. Substituted 3-formyl chromones (2) have been synthesized from various substituted 2-hydroxy acetophenones by formylation (Vilsmeier-Haack reaction).



Melting points were determined in open capillary tubes and are uncorrected. The UV spectra (MeOH) and IR spectra (KBr/nujol) were recorded on Shimadzu UV-visible spectrophotometer and Perkin-Elmer model respectively.

Substituted 2-hydroxy acetophenones (1) were prepared by reported procedure<sup>4-6</sup>.

**6-Chloro-8-nitro-3-formyl-chromone (2b):** Dimethylformamide (6.0 mL) was cooled in ice-cold water and 2-hydroxy-3-nitro-5-chloro acetophenone (2.15 g, 0.01 mol) was added to this with vigorous stirring; phosphorus oxychloride (2.0 mL, 0.025 mol) was slowly added into it. The pink colour thick mass was kept overnight at room temperature. It was then decomposed by cold water. The solid obtained was crystallized from ethanol, yield (71%), m.p. 108°C.

UV spectrum ( $\text{CH}_3\text{OH}$ ):  $\lambda_{\text{max}}$  216 and 300 nm. IR spectra ( $\text{KBr cm}^{-1}$ ): 3084.2

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$\nu(\text{Ar, C—H})$ , 16550  $\nu(\text{C=O})$ , 1538  $\nu(\text{C—N})$ , 1452 and 1351.2  $\nu(\text{Ar—NO}_2)$ , 1245.9  $\nu(\text{C—O—C})$ , 769.4  $\nu(\text{C—Cl})$ .

All other compounds (**2a-o**) of this series were prepared by the same procedure and their analytical data are recorded in Table-1.

TABLE-1  
PHYSICAL DATA OF SUBSTITUTED 3-FORMYL CHROMONES (**2a-o**)

| S. No.                                   | Compounds (m.f.)   | Yield (%) | m.p. (°C) | Elemental Analysis |          | H     |          |
|--|--|-----------|-----------|--------------------|----------|-------|----------|
|  |  |           |           | Found              | (Calcd.) | Found | (Calcd.) |
| <b>(i) 6-Chloro-3-formyl chromones</b>   |  |           |           |                    |          |       |          |
| (a)                                      | 6-Chloro-3-formyl chromone<br>(C <sub>10</sub> H <sub>5</sub> O <sub>3</sub> Cl)                 | 71        | 168       | 57.43              | 57.55    | 2.32  | 2.39     |
| (b)                                      | 6-Chloro-8-nitro-3-formyl chromone<br>(C <sub>10</sub> H <sub>4</sub> NO <sub>5</sub> Cl)        | 67        | 108       | 47.24              | 47.33    | 1.51  | 1.57     |
| (c)                                      | 6-Chloro-8-bromo-3-formyl chromone<br>(C <sub>10</sub> H <sub>4</sub> O <sub>3</sub> ClBr)       | 65        | 155       | 41.61              | 41.73    | 1.31  | 1.39     |
| <b>(ii) 6-Methyl-3-formyl-chromones</b>  |  |           |           |                    |          |       |          |
| (d)                                      | 6-Methyl-3-formyl chromone<br>(C <sub>11</sub> H <sub>8</sub> O <sub>3</sub> )                   | 73        | 173       | 70.11              | 70.21    | 4.19  | 4.25     |
| (e)                                      | 6-Methyl-8-nitro-3-formyl chromone<br>(C <sub>11</sub> H <sub>7</sub> NO <sub>5</sub> )          | 69        | 180       | 59.09              | 59.19    | 3.06  | 3.13     |
| (f)                                      | 6-Methyl-8-bromo-3-formyl chromone<br>(C <sub>11</sub> H <sub>7</sub> O <sub>3</sub> Br)         | 66        | 145       | 49.35              | 49.43    | 2.57  | 2.62     |
| <b>(iii) 6-Nitro-3-formyl chromones</b>  |  |           |           |                    |          |       |          |
| (g)                                      | 6-Nitro-3-formyl chromone<br>(C <sub>10</sub> H <sub>5</sub> NO <sub>5</sub> )                   | 70        | 160       | 54.69              | 54.79    | 2.20  | 2.28     |
| (h)                                      | 6,8-Dinitro-3-formyl chromone<br>(C <sub>10</sub> H <sub>4</sub> N <sub>2</sub> O <sub>7</sub> ) | 58        | 104       | 45.38              | 45.45    | 1.46  | 1.51     |
| (i)                                      | 6-Nitro-8-bromo-3-formyl chromone<br>(C <sub>10</sub> H <sub>4</sub> NO <sub>5</sub> Br)         | 63        | 80.82     | 40.16              | 40.26    | 1.26  | 1.34     |
| <b>(iv) 6-Hydroxy-3-formyl chromones</b> |  |           |           |                    |          |       |          |
| (j)                                      | 6-Hydroxy-3-formyl chromone<br>(C <sub>10</sub> H <sub>6</sub> O <sub>4</sub> )                  | 68        | 198       | 60.78              | 60.91    | 2.96  | 3.04     |
| (k)                                      | 6-Hydroxy-8-nitro-3-formyl chromone<br>(C <sub>10</sub> H <sub>5</sub> NO <sub>6</sub> )         | 54        | 153       | 50.96              | 51.06    | 2.07  | 2.12     |
| (l)                                      | 6-Hydroxy-8-bromo-3-formyl chromone<br>(C <sub>10</sub> H <sub>5</sub> O <sub>4</sub> Br)        | 58        | 189       | 44.48              | 44.60    | 1.76  | 1.85     |
| <b>(v) 7-Hydroxy-3-formyl chromones</b>  |  |           |           |                    |          |       |          |
| (m)                                      | 7-Hydroxy-3-formyl chromone<br>(C <sub>10</sub> H <sub>6</sub> O <sub>4</sub> )                  | 80        | 269       | 60.80              | 60.91    | 2.98  | 3.04     |
| (n)                                      | 7-Hydroxy-8-nitro-3-formyl chromone<br>(C <sub>10</sub> H <sub>5</sub> NO <sub>6</sub> )         | 64        | 162       | 50.94              | 51.06    | 2.07  | 2.12     |
| (o)                                      | 7-Hydroxy-8-bromo-3-formyl chromone<br>(C <sub>10</sub> H <sub>5</sub> O <sub>4</sub> Br)        | 74        | 210       | 44.50              | 44.60    | 1.79  | 1.85     |

### Antibacterial activity

The compounds (2) were screened for antibacterial activity and tested using paper disc method<sup>7</sup> at 100 µg/mL concentration against gram positive bacteria *S. aureus* and gram negative bacteria *E. coli*. Most of the compounds were found to have moderate activity against both the bacteria. The results of antibacterial study are compiled in Table-2.

TABLE-2  
RESULTS OF ANTIBACTERIAL STUDY

| Compounds                   | 8-H            |                  | 8-Nitro        |                  | 8-Bromo        |                  |
|-----------------------------|----------------|------------------|----------------|------------------|----------------|------------------|
|                             | <i>E. coli</i> | <i>S. aureus</i> | <i>E. coli</i> | <i>S. aureus</i> | <i>E. coli</i> | <i>S. aureus</i> |
| 6-Chloro-3-formyl chromone  | -              | +                | +              | +                | +              | -                |
| 6-Methyl-3-formyl chromone  | +              | -                | +              | -                | +              | -                |
| 6-Nitro-3-formyl chromone   | +              | +                | +              | ++               | ++             | ++               |
| 6-Hydroxy-3-formyl chromone | +              | +                | ++             |                  | -              | +                |
| 7-Hydroxy-3-formyl chromone | ++             | +                | ++             | +                | +              | -                |

(++) Active, (+) Moderately active, (-) Inactive.

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