Cyclization reactions of hydrazones. VII.
Synthesis of some 2-aryl-3-oxo-2,3-dihydro-5H-1,2,4-
-triazino[5,6-b]indoles

P. PEČ and J. SLOUKA

Department of Analytical and Organic Chemistry, Faculty of Natural Sciences,
Palacký University, 771 46 Olomouc

Received 2 December 1974

By coupling diazonium salts with ethoxycarbonylamino-indole a series
of 2-ethoxycarbonylimino-3-arylhydrazono-indolines (Ia—II) was prepared.
Their cyclization yielded quantitatively the corresponding 2-aryl-3-oxo-
-2,3-dihydro-5H-1,2,4-triazino[5,6-b]indoles (IIa—IIi).

Соединением диазониевых солей с 2-этоксикарбониламино-индолом
была приготовлена серия 2-этоксикарбонилимино-3-арилгидразоно-ин-
долинов (Ia—Ii). После их циклизации в выходе, равном теоретическому,
были получены соответствующие 2-арил-3-оксо-2,3-диgidро-5H-1,2,4-три-
азино[5,6-b]индолы (IIa—IIi).

Until now only two cyclization reactions affording 3-oxo-2,3-dihydro-1,2,4-tri-
azino[5,6-b]indoles have been described. The first one is the cyclization of 3,5-dioxo-6-
-(o-aminophenyl)-2,3,4,5-tetrahydro-1,2,4-triazine [1, 2]. The second reaction de-
scribed involves the cyclization of N-methylisatine semicarbazone [3]. Both these
reactions proceed rather slowly and the second one gives only a very low yield.
The analogous cyclization of unsubstituted isatine semicarbazone did not even
proceed [3].

In this paper a new method for the 1,2,4-triazino[5,6-b]indole ring formation
is described. The reaction is based on the principle used earlier in our work in the
preparation of pyrazolo[3,4-e]-1,2,4-triazines [4].

The coupling of diazonium salts with 2-ethoxycarbonylamino-indole yielded
readily the corresponding 2-ethoxycarbonylimino-3-arylhydrazono-indolines (Ia—Ii)
which are tautomeric forms of corresponding arylazo derivatives. These compounds
were then subjected to thermal cyclization and yielded nearly quantitatively the
corresponding 2-aryl-3-oxo-2,3-dihydro-5H-1,2,4-triazino[5,6-b]indoles (IIa—IIi).

The problem of tautomerism in 3-oxo-2,3-dihydro-1,2,4-triazino[5,6-b]indoles
has been already investigated by the Soviet authors [5]. From the similarity of
the electronic spectra of unsubstituted compound and of its 5-methyl- and 2,5-di-
methyl derivative it follows that these compounds exist in their 5H tautomeric
forms. Therefore, it can be assumed that also the 2-aryl derivatives (IIa—IIi)
prepared by us are in their tautomeric forms.
Table 1
Characterization of the synthesized compounds

<table>
<thead>
<tr>
<th>No.</th>
<th>Formula</th>
<th>M</th>
<th>Calculated/found</th>
<th>Yield</th>
<th>M.p.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>% C</td>
<td>% H</td>
<td>% N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ia</td>
<td>C_{17}H_{16}N_{4}O_{2}</td>
<td>308.26</td>
<td>66.22</td>
<td>5.23</td>
<td>18.77</td>
</tr>
<tr>
<td>Ib</td>
<td>C_{13}H_{18}N_{4}O_{2}</td>
<td>322.36</td>
<td>67.06</td>
<td>5.32</td>
<td>18.24</td>
</tr>
<tr>
<td>Ic</td>
<td>C_{17}H_{15}N_{4}O_{2}F</td>
<td>326.23</td>
<td>62.63</td>
<td>4.63</td>
<td>17.18</td>
</tr>
<tr>
<td>Id</td>
<td>C_{17}H_{15}N_{4}O_{2}Cl</td>
<td>342.79</td>
<td>59.53</td>
<td>4.40</td>
<td>16.33</td>
</tr>
<tr>
<td>Ie</td>
<td>C_{17}H_{15}N_{4}O_{2}Br</td>
<td>387.24</td>
<td>52.76</td>
<td>3.90</td>
<td>14.48</td>
</tr>
<tr>
<td>If</td>
<td>C_{17}H_{15}N_{4}O_{2}I</td>
<td>434.23</td>
<td>47.05</td>
<td>3.48</td>
<td>12.90</td>
</tr>
<tr>
<td>Ig</td>
<td>C_{19}H_{18}N_{4}O_{3}</td>
<td>338.36</td>
<td>63.89</td>
<td>5.36</td>
<td>16.56</td>
</tr>
<tr>
<td>Ih</td>
<td>C_{19}H_{18}N_{4}O_{3}</td>
<td>350.37</td>
<td>65.13</td>
<td>5.18</td>
<td>15.99</td>
</tr>
<tr>
<td>Ii</td>
<td>C_{21}H_{12}N_{4}O_{2}</td>
<td>358.38</td>
<td>70.37</td>
<td>5.06</td>
<td>15.63</td>
</tr>
<tr>
<td>IIa</td>
<td>C_{13}H_{10}N_{4}O</td>
<td>262.26</td>
<td>68.69</td>
<td>3.84</td>
<td>21.37</td>
</tr>
<tr>
<td>IIb</td>
<td>C_{16}H_{12}N_{4}O</td>
<td>276.29</td>
<td>69.55</td>
<td>4.38</td>
<td>20.28</td>
</tr>
<tr>
<td>IIc</td>
<td>C_{13}H_{7}N_{4}OF</td>
<td>280.26</td>
<td>64.34</td>
<td>3.24</td>
<td>20.01</td>
</tr>
<tr>
<td>IId</td>
<td>C_{13}H_{7}N_{4}OCl</td>
<td>296.72</td>
<td>60.66</td>
<td>3.05</td>
<td>18.88</td>
</tr>
<tr>
<td>IIf</td>
<td>C_{13}H_{7}N_{4}OBr</td>
<td>341.16</td>
<td>52.83</td>
<td>2.66</td>
<td>16.43</td>
</tr>
<tr>
<td>IIf</td>
<td>C_{13}H_{7}N_{4}OI</td>
<td>388.17</td>
<td>46.43</td>
<td>2.33</td>
<td>14.44</td>
</tr>
<tr>
<td>IiF</td>
<td>C_{16}H_{12}N_{4}O_{2}</td>
<td>292.29</td>
<td>65.75</td>
<td>4.14</td>
<td>19.17</td>
</tr>
<tr>
<td>Iii</td>
<td>C_{17}H_{12}N_{4}O_{2}</td>
<td>309.30</td>
<td>67.09</td>
<td>3.98</td>
<td>18.41</td>
</tr>
<tr>
<td>Iii</td>
<td>C_{19}H_{12}N_{4}O</td>
<td>312.32</td>
<td>73.06</td>
<td>3.87</td>
<td>17.95</td>
</tr>
</tbody>
</table>
Experimental

2-Ethoxycarbonylimino-3-arylhydrazono-indolines (Ia—IIi)

Aromatic amine (2 millimoles) was diazotated in ice-cold water (15 ml) containing 37\% HCl (3.5 ml) and ice (5 g) unter stirring and cooling with NaNO$_2$ (140 mg; 2 millimoles) dissolved in ice-cold water (8 ml). After 10 min the solution of diazonium salt was gradually added unter mixing and cooling into a solution of 2-ethoxycarbonylamino-indole [6] (410 mg; 2 millimoles) in pyridine (40 ml) cooled to 5—6°C. After 12-hrs standing the sedimented yellow precipitate of the corresponding hydrazone I was filtered, washed with water, dried, and weighed. The samples for analysis were purified by recrystallization from ethanol. The characteristic properties of hydrazones are summarized in Table 1.

2-Aryl-3-oxo-2,3-dihydro-5H-1,2,4-triazino[5,6-b]indoles (IIa—IIIi)

The corresponding hydrazone I (2 millimoles) was heated unter reflux with cis decaline (20 ml) for 15 min. Already after a short boiling the formation of a crystalline precipitate in a clear solution was observed. After cooling the precipitate was filtered, washed with a small volume of light petroleum, dried, and weighed. The samples for analysis were recrystallized from acetic acid. The characteristic properties of the prepared compounds are summarized in Table 1.

References


Translated by V. Farkaš