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

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

Until now only two cyclization reactions affording 3-oxo-2,3-dihydro-1,2,4-triazino[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 described 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].

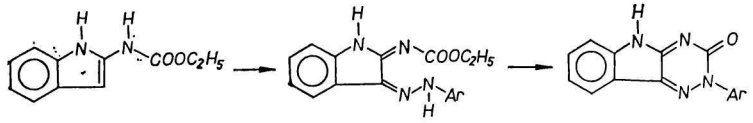
The coupling of diazonium salts with 2-ethoxycarbonylamino-indole yielded readily the corresponding 2-ethoxycarbonylimino-3-arylhydrazono-indolines (*Ia*—*Ii*) which are tautomeric forms of corresponding arylazo derivatives. These compounds were then subjected to thermal cyclization and yielded nearly quantitatively the corresponding 2-aryl-3-oxo-2,3-dihydro-5*H*-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-dimethyl derivative it follows that these compounds exist in their 5*H* 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

No.	Formula	*M*	Calculated/found			Yield %	M.p. °C
			% C	% H	% N		
Ia	$C_{17}H_{16}N_4O_2$	308.26	66.22 66.10	5.23 5.32	18.77 18.24	94	184—185
Ib	$C_{18}H_{18}N_4O_2$	322.36	67.06 66.90	5.63 5.41	17.38 17.00	94	192—193
Ic	$C_{17}H_{15}N_4O_2F$	326.23	62.63 62.50	4.63 4.82	17.18 17.30		173—175
Id	$C_{17}H_{15}N_4O_2Cl$	342.79	59.53 59.58	4.40 4.61	16.33 16.12	96	218—220
Ie	$C_{17}H_{15}N_4O_2Br$	387.24	52.76 52.93	3.90 4.17	14.48 14.36	90	218—220
If	$C_{17}H_{15}N_4O_2I$	434.23	47.05 46.82	3.48 3.29	12.90 12.86	96	228—230
Ig	$C_{18}H_{18}N_4O_3$	338.36	63.89 63.58	5.36 5.29	16.56 16.41	82	188—189
Ih	$C_{19}H_{18}N_4O_3$	350.37	65.13 65.26	5.18 5.29	15.99 15.76	91	197—199
Ii	$C_{21}H_{18}N_4O_2$	358.38	70.37 70.52	5.06 4.85	15.63 15.82	98	212—214
IIa	$C_{15}H_{10}N_4O$	262.26	68.69 68.54	3.84 3.92	21.37 21.02	98	above 360
IIb	$C_{16}H_{12}N_4O$	276.29	69.55 69.51	4.38 4.46	20.28 20.06	100	above 360
IIc	$C_{15}H_9N_4OF$	280.26	64.34 64.54	3.24 3.46	20.01 19.83	100	above 360
IId	$C_{15}H_9N_4OCl$	296.72	60.66 60.51	3.05 3.26	18.88 18.66	100	above 360
IIe	$C_{15}H_9N_4OBr$	341.16	52.83 52.60	2.66 2.91	16.43 16.71	100	above 360
IIf	$C_{15}H_9N_4OI$	388.17	46.43 46.58	2.33 2.16	14.44 14.29	100	above 360
IIg	$C_{16}H_{12}N_4O_2$	292.29	65.75 65.45	4.14 4.08	19.17 19.26	100	above 360
IIh	$C_{17}H_{12}N_4O_2$	309.30	67.09 66.83	3.98 4.10	18.41 18.19	100	above 360
IIi	$C_{19}H_{12}N_4O$	312.32	73.06 72.86	3.87 3.58	17.95 17.72	100	above 360



I *II*

Scheme 1

Ar = phenyl	(*a*)	*p*-iodophenyl	(*f*)
p-tolyl	(*b*)	*p*-methoxyphenyl	(*g*)
p-fluorophenyl	(*c*)	*p*-acetylphenyl	(*h*)
p-chlorophenyl	(*d*)	α-naphthyl	(*i*)
p-bromophenyl	(*e*)		

Experimental

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

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 under 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—IIi)

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

1. Ioffe, I. S. and Tomchin, A. B., *Zh. Obshch. Khim.* ***40***, 859 (1970).
2. Tomchin, A. B. and Ioffe, I. S., *Zh. Org. Khim.* ***8***, 1287 (1972).
3. Ioffe, I. S., Tomchin, A. B., and Rusakov, E. A., *Zh. Obshch. Khim.* ***39***, 2345 (1969).
4. Slouka, J. and Peč, P., *Monatsh. Chem.* ***103***, 1444 (1972).
5. Ioffe, I. S., Tomchin, A. B., and Zhukova, E. N., *Zh. Obshch. Khim.* ***39***, 2339 (1969).
6. Piccini, A. and Salmoni, L., *Gazz. Chim. Ital.* ***32***, I, 246 (1902).

Translated by V. Farkaš