SYNTHESIS OF AROMATIC DERIVATES OF THE 5-OXOPYRAZOLO[4,5-B]PYRIDINE.

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Keywords: Chalcone, 3-amino-5-pyrazolone, oxopyrazolopyridine.

ABSTRACT

The ciclocondensation of chalconas with 3-amino-5-pyrazolone in DMF was studied, which leads to the formation of 2-aryl-2-phenyl-5-oxopyrazolo[4,5-b]pyridines. The structures of compounds obtained was determined based on spectroscopic analysis (^{1}H and ^{13}C-nmr and mass spectrometry).

RESUMEN

Se estudió la ciclocondensación de chalconas con 3-amino-5-pirazolona, la cual lleva a la formación de 2-aril-4-fenil-5-oxopirazolo[4,5-b]piridinas. Las estructuras de los compuestos obtenidos se determinó con base en los análisis espectroscópicos (RMN ^{1}H y ^{13}C y espectrometría de masas).

INTRODUCTION

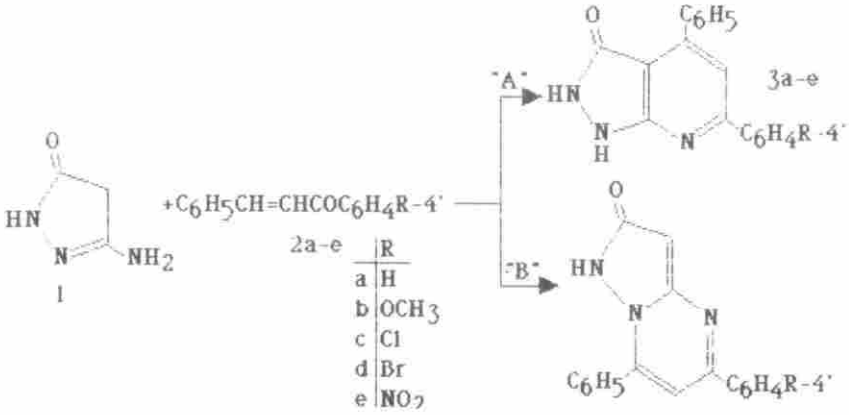
Continuing the study of reactions of pyrazol aminoderivatives with α,β-unsaturated aromatic ketones [1,2] we carried out experiments on the interaction of the 3-amino-5-pyrazolone [1] with chalcones [2a-e]. The interest of studying this aminopyrazole in its reaction with chalcones is due to the possibility of two cyclization routes. In the reactions of aminopyrazoles without substituent at the nitogen atom with carbonyl compounds, it is feasible to obtain derivatives of pyrazolo[4,5-b]pyridines (3,4) or pyrazolo[1,5-a]pyrimidines (4-6) and even a mixture of these two products (4,7).

RESULTS AND DISCUSSION

The interactior of 3-amino-5-pyrazolone [1] with chalcones [2] may, in principle, lead to the formation of two isomeric products:

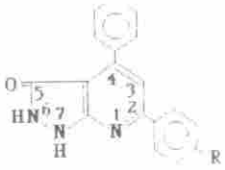
In our study heating equimolecular amounts of amine [1] and ketones [2a-e] in DMF we obtained compounds 3a-e. Spectroscopic and cromatographic control showed that the syntethyzed compounds belong to a series of isomers.

The products of the reaction "A" and "B" are differentiated in so far as in the first one there are two NH protons and one CH proton from the pyridine ring, while in the second product ["B"] there are only one proton from an HN group and two CH protons, one from the pyrimidinic cycle and one from the pyrazolic cycle.



This explains why the problem concerning the tendency of the cyclization process is solved by nmr-spectroscopy. In the ^{1}H-nmr spectra of the compounds 3a-e, measured in DMSO-d6, two singlets at low field (10.90-12.50 ppm) are clearly visible, these belong to two protons of NH group of the pyrazolic ring; additionally a signal was observed in the aromatic region (7.57-7.76 ppm) belonging to the aromatic proton of the pyridine ring (table 1). This serves as a confirmation of way "A" in the studied reaction.

Table 1. ^{1}H-nmr data of 3a-e (δ values in DMSO-d6)



3	3H	6H	7H	aromatic H
a	7.57	12.17	10.92	8.17(2H),7.82(2H),7.50(6H)
b	7.57	12.17	10.90	8.16(2H),7.83(2H),7.49(2H),7.06(2H), 8.44(1H)
c	7.62	12.32	10.90	8.23(2H),7.83(2H),7.58(2H),7.51(3H)
d	7.62	12.33	10.92	8.16(2H),7.83(2H),7.70(2H),7.50(3H)
e	7.76	12.49	11.02	8.34(2H),7.85(2H),7.52(2H),7.50(1H), 8.48(2H)

The final elucidation of structure of compounds 3a-e was carried out by analysis of the ^{13}C-nmr spectra (spin-echo),in which the number of signals belonging to quaternary and tertiary carbon atoms compounds 3a-e could be determined (tabla 2).

EXPERIMETAL PART

Melting point were taken on a Buchi melting point apparatus. The ^{1}H and ^{13}C- nmr spectra were run on a Bruker AM 400 in DMSO-d6. The mass spectra were recorded on a varian MAT711 and Finnigan M 95 operating at 70 eV.

2-aryl-4-phenyl-5-oxopyrazolo[4,5-b]pyridine [3a-e]

General procedure (1),(2).

A solution of 0,5 g (5.0 mmol) 3-amino-5-pyrazolone (1) and 5,0 mmol of chalcone (2a-e) in 2 ml DMF was refluxed. The reaction can be controlled by TLC on silica gel. After the starting compounds have almost completely disapeared, the solution is cooled and the precipitate formed over night is filtered off.

Table 2. ^{13}C-nmr data of 3a-e (values in DMSO-d6)

	Pyrazolo[4,5-b]pyridine				C aromatic		
3	C-2,4,5	C-3	C-4a	C-7a	Ci	Co,m	Cp
a	156.6 154.3 154.0	112.8	100.4	145.9	138.8 136.5	129.6 128.7 128.0 127.3	129.3 128.8
b	156.3 154.3 154.1	112.2	98.8	145.8	136.5 131.15	129.6 114.1 128.1 128.7	160.4 128.8
c	155.1 154.0 153.7	112.6	100.4	146.0	137.6 136.3	129.6 129.0 129.3 128.0	134.1 128.8
d	155.1 154.1 153.7	112.6	100.4	146.0	137.9 136.4	128.1 129.7 129.3 131.7	123.0 128.9
e	154.0 153.7 153.5	113.4	100.9	146.2	136.1 144.8	128.0 123.8 128.4 129.7	147.8 129.0

2,4-Diphenyl-5-oxopyrazolo[4,5-b]pyridine [**3a**]
The compound was obtained according to the general procedure as yellow crystals, mp 264-5 °C, yield (45%). The mass spectum a shows the following peaks: m/z (%)= 288(47.6), 287(100, M⁺), 286(15.5), 231(12.7), 230(47.0), 228(10.0), 203(10.0), 202(17.5), 143(15.9), 128(10.0), 127(12.1), 102(21.3), 101(12.2), 77(22.3).

2-(4-methoxyphenyl)-4-phenyl-5-oxopyrazolo[4,5-b]pyridine [**3b**].
The compound was obtained according to the general procedure as yellow crystal, mp 267-8 °C, yield (40%). The mass spectrum shows the following peaks: m/z (%)= 317(18.6 M⁺), 217(11.7), 189(10.0), 128(10.2), 102(13.5), 101(10.0), 91(10.1), 90(12.3), 89(54.4), 88(11.5), 78(20.7), 77(100).

2-(4-Chlorophenyl)-4-phenyl-5-oxopyrazolo[4,5-b]pyridine [**3c**].
The compound was obtained according to the general procedure as yellow crystals, mp 296-8 °C yield (65%). The mass spectrum shows the following peaks: m/z (%)= 323(36.8), 322(26.6), 321(100, M⁺), 264(18.7), 230(10.6), 227(10.1), 202(10.8), 127(10.0), 101(10.5), 77(10.0).

2-(4-Bromophenyl)-4-phenyl-5-oxopyrazolo[4,5-b]pyridine [**3d**].
The compound was obtained according to the general procedure as yellow crystals, mp 278-80 °C, yield (70%). The mass spectrum shows the following peaks: m/z (%)= 368(19.7), 367(60.7), 366(22.9, M⁺), 365(59.5), 230(28.5), 229(26.9), 228(24.4), 227(20.0), 202(20.4), 166(21.1), 165(19.2), 129(16.3), 127(13.9), 112(40.5), 111(26.9), 105(15.1), 101(13.1), 77(25.0).

2-(4-Nitrophenyl)-4-phenyl-5-oxopyrazolo[4,5-b]pyridine [**3e**].
The compound was obtained according to the general procedure as yellow crystals, mp 304-5 °C, yield (76%). The mass spectrum shows the following peaks: m/z (%)= 333(20.1), 332(100, M⁺), 286(21.6), 230(20.1), 229(24.4), 228(29.5), 227(18.3), 202(18.8), 201(10.0), 189(10.0), 77(10.1).

ACKNOWLEDGMENTS

This work was supported by COLCIENCIAS.

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