

New Route for the Synthesis of 3-Anilino-4-Aryl-Hydrazono-1-Phenyl-2-Pyrazolin-5-Ones

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A convenient route was reported for the synthesis of 3-anilino-4-arylazo-1-phenyl-2-pyrazolin-5-ones to improve their yields. The structures of the obtained products were supported by spectral data.

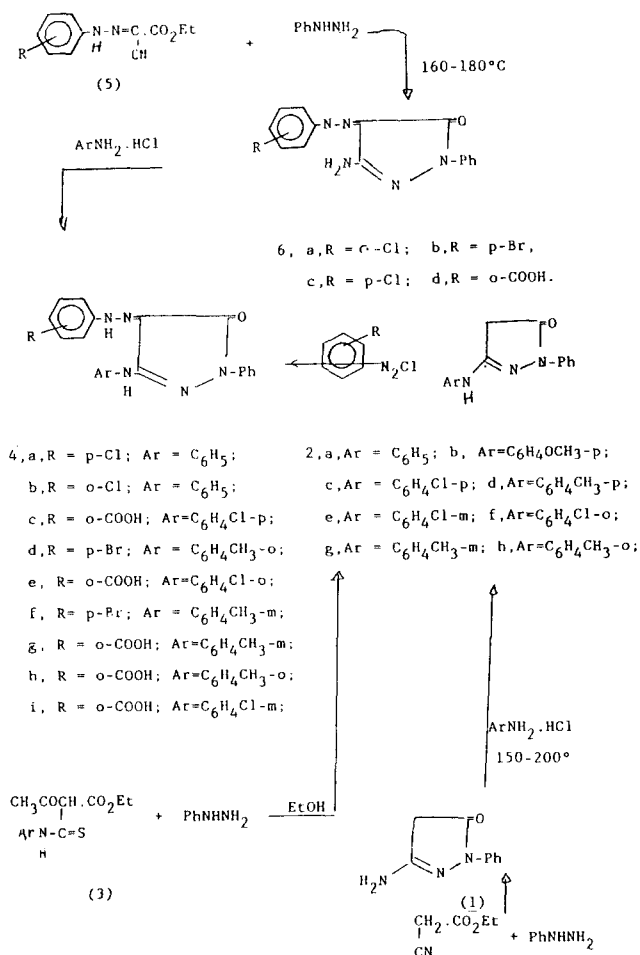
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INTRODUCTION

An enormous number of 2-pyrazolin-5-ones have found use in medicine as analgesics and antipyretics and in colour photography as magenta dye formers (Wiley and Wiley, 1964). An important addition to this class of compounds has been the 3-anilino-4-arylazo-1-phenyl-2-pyrazolin-5-ones. Our previous work (Metwally and Amer, 1983; Metwally and Afsah, 1984; Metwally *et al.*, 1985; Metwally *et al.*, 1986 and Metwally *et al.*, 1989) showed the validity of 2-pyrazolin-5-ones as key intermediate for the synthesis of several dyes, analgesics, and anticancer agents. Weissberger and Potter, 1942, reported the formation of 3-anilino-1-phenyl-2-pyrazolin-5-one (**2a-c, g-h**) from fusion of 3-amino-1-phenyl-2-pyrazolin-5-one (**1**) with aromatic amines at 150-200°C (Worrel, 1922) synthesized the same compound by treatment of ethyl α -aryl thiocarbonylglyoxalates (**3**) with phenylhydrazine. The purpose of the present study was to synthesize 3-anilino-4-arylazo-1-phenyl-2-pyrazolin-5-ones by new methods to improve the yield percentage.

MATERIALS AND METHOD

Melting points are uncorrected. Microanalysis of C and H were determined at Microanalytical Lab., Faculty of Science, University of Mansoura, IR spectra in KBr were recorded on a Pye Unicam 2000 Infrared Spectrophotometer, ¹H-NMR spectra in CDCl₃ were deter-



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mined on a Bruker 400 MHz and Varian 200 MHz apparatus.

Table I. 1-Phenyl-3-arylamino-2-pyrazolin-5-ones (**2a-f**) and 4-arylhydrazono-1-phenyl-3-arylamino-2-pyrazolin-5-ones (**4a-j**)

Compd.	Colour	Yield (%)	m.p. (°C)	Mol. formula (M.Wt.)	Found % (Calcd. %)			IR cm ⁻¹	¹ H-NMR (ppm)
					C	H	N		
2d	Pale-yellow	91	165	C ₁₆ H ₁₅ N ₃ O (265.30)	72.51 (72.43)	5.59 5.69	15.91 15.83	1690, 3190	2.0(s, 2H, CH ₂), 2.3(s, 3H, CH ₃), 7.8(m, 9H, ArH), 13.15(s, 1H, NH)
2e*	Page	92	175	C ₁₅ H ₁₂ N ₃ OCl (285.727)	63.13 (63.04)	4.29 4.23	15.61 14.70	1685, 3205	1.9(s, 2H, CH ₂), 8.9-7.59(m, 9H, ArH), 13.2(s, 1H, NH)
2f*	Page	93	132	C ₁₅ H ₁₂ N ₃ OCl (285.727)	63.11 (63.04)	4.29 4.23	14.68 14.70	1690, 3190	
4a*	Brown	94	140	C ₂₁ H ₁₆ N ₅ OCl (389.837)	64.81 (64.69)	4.09 4.13	17.91 17.96	1595, 1605, 3195, 1705, 3210	7.2-7.9(m, 14H, Ar), 13.15(m, 2H, two NH)
4b*	Brown	92	105	C ₂₁ H ₁₆ N ₅ OCl (389.837)	64.71 (64.69)	4.21 4.13	17.89 17.96	1595, 1605, 1705, 3195, 3210	
4c*	Reddish-brown	91	>250	C ₂₂ H ₁₆ N ₅ O ₃ Cl (433.847)	61.01 (60.90)	3.69 3.71	16.19 16.14	1590, 1600, 1710, 1750, 3180, 3230, 3420	6.95-7.69(m, 13H, ArH), 13.25(m, 2H, two NH), 14.1(s, 1H, OH)
4d*	Brown	94	217	C ₂₂ H ₁₆ N ₅ OBr (448.316)	59.04 (58.93)	4.11 4.04	15.53 15.62	1600, 1610, 1720, 3105, 3215	2.35(s, 3H, CH ₃), 7.15-7.9(m, 13H, ArH), 13.12(m, 2H, two NH)
4e*	Brownish-red	92	230	C ₂₂ H ₁₆ N ₅ O ₃ Cl (433.847)	60.98 (60.90)	3.81 3.71	16.23 16.14	1590, 1600, 1710, 1750, 3180, 3230, 3420	
4f*	Reddish-brown	93	232	C ₂₂ H ₁₆ N ₅ OBr (448.316)	58.83 (58.93)	4.11 4.04	15.71 15.62	1600, 1620, 1720, 3105, 3215	2.31(s, 3H, CH ₃), 7.1-7.96(m, 13H, ArH), 13.6(m, 2H, two NH)
4g	Brown	94	205	C ₂₃ H ₁₉ N ₅ O ₃ (413.42)	66.91 (66.81)	4.72 4.63	16.89 16.94	1590, 1600, 1710, 1750, 3180, 3230, 3420	
4h	Brown	91	225	C ₂₃ H ₁₉ N ₅ O ₃ (413.42)	66.93 (66.81)	4.71 4.63	17.09 16.94	1590, 1600, 1710, 1750, 3180, 3230, 3420	
4i*	Reddish-brown	94	173	C ₂₂ H ₁₆ N ₅ O ₃ Cl (433.847)	60.89 (60.90)	3.59 3.71	16.19 16.14	1590, 1600, 1710, 1750, 3180, 3230, 3420	

***2e**, Cl%=(14.4), 14.59; **2f**, Cl%=(14.4), 14.29; **4a**, Cl%=(9.09), 9.14; **4b**, Cl%=(9.09), 8.91; **4c**, Cl%=(8.17), 8.31; **4d**, Br%=(17.82), 17.96; **4e**, Cl%=(8.17), 8.10; **4f**, Br%=(17.82), 18.01; **4i**, Cl%(8.17), 8.41.

3-Amino-4-arylhydrazono-1-phenyl-2-pyrazolin-5-ones (6a-d) (Metwally and Amer, 1983)

The compounds were prepared adopting the general procedure of fusion compounds **5** with phenylhydrazine at 160-180°C (Metwally et al., 1985). The solid products proved to be identical with those reported (m.p. and mixed m.p.) IR and ¹H-NMR spectra (Elnagdi and Allah, 1974).

3-Anilino-1-phenyl-2-pyrazolin-5-ones (2a-h)

These compounds were prepared according to the

above method. Compounds **2a-c**, **g-h** were reported previously (Dolbin et al., 1969). The new derivatives are seen in Table I.

3-Anilino-4-arylazo-1-phenyl-2-pyrazolin-5-ones (4a-i)

Method 1: A mixture of **6** (0.01 mol) and the appropriate aromatic amine hydrochloride (0.015 mol) was fused at 180-200°C for 1-1.5 hrs, left to stand overnight and crystallized from ethanol to give compounds **4a-i** (see Table I).

Method 2: To (0.01 mol) of each of (**2a-h**) in ethanol (30 ml) containing (1 g) sodium acetate was added

(0.01 mol) of the appropriate aryl diazonium chloride. The solid products that separated were filtered off and recrystallized from ethanol to give compounds (4a-i).

RESULTS AND DISCUSSION

The first method includes the synthesis of the known 3-amino-4-arylhydrazono-1-phenyl-2-pyrazolin-5-ones (6) (Elnagdi and Allah, 1974) from fusion of (5) with phenylhydrazine at 160-180°C, which underwent transamination to 3-anilino-4-arylhydrazono-1-phenyl-2-pyrazolin-5-ones (4) in 95% yield.

While the second method consists of coupling the aromatic diazonium salts with 3-anilino-1-phenyl-2-pyrazolin-5-ones (2) to give (4) in 92% yield. Their m.p's and spectra (IR and ¹H-NMR) were found to be identical with those of authentic materials synthesized according to the first method (see Table I).

In connection with the above methods the yield percentage ranged between 92 and 95% while the reported yields ranged between 65 and 78% (Wiley and Wiley, 1964; Doblin et al., 1969).

REFERENCES CITED

- Elnagdi, M. H., Allah, S. D. A., Reaction with the arylhydrazones of some α -cyano ketones. *J. Prakt. Chem.*, 315, 1009-1016 (1973); *Chem. Abstr.*, 80, 82349J (1974).
- Doblin, V. N., Erokhim, V. K., Soloveva, I. A., Synthesis of substituted 3-arylamino-5-pyrazolinones, *Khim. Geterotsikl. Soedin. sb. 1: Azotsoderzhashchie Geterotsikl* 1967, 92-7 (Russ.); *Chem. Abstr.*, 70, 115056k (1969).
- Metwally, M. A. and Amer, F. A., Synthesis of some 4,4'-biphenylenedihydrazono-3-(3'-methyl)-2-pyrazolin-4,5-dione derivatives and their antimicrobial potentialities. *Die Pharmazie*, 38, 172-173 (1983).
- Metwally, M. A. and Afsah, E., Synthesis of some new pyrimidoquinazolines, pyridoquinoline and related compounds from 1,4-bis(ethoxycarbonyl)-2,5-diamino-1,4-cyclohexadiene. *Die Pharmazie*, 39, 95-96 (1984).
- Metwally, M. A., Fadda, A. A., Hassan, H. M. and Afsah, E., Synthesis of some 2-pyrazolin-5-one derivatives structurally related to certain analgesic and antipyretic drugs. *Org. Prep. Proc. Int.*, 17(3), 198-203 (1985).
- Metwally, S. A., Younes, M. I. and Metwally, M. A., Synthesis and some reactions of 3-methyl-4-aryl-1-phenyl-1H-pyrazolo [3,4-d]pyrimidine-6-thiols. *Croatica Chem. Acta*, 59(2), 483-489 (1986).
- Metwally, M. A., Darwish, Y. M. and Amer, F. A., Synthesis and some reactions of 4-aryloxy-5-hydrazino-3-methyl-1-phenyl-pyrazoles. *Indian J. Chem.* 28B, 1069-1071 (1989).
- Weissberger, A. and Porter, D., Investigation of pyrazole compounds I. *J. Amer. Chem. Soc.* 64, 2133-2136 (1942).
- Wiley, R. H. and Wiley, P., Pyrazolones, pyrazolidones, and derivatives, Weissberger, A., Ed., John Wiley and Sons, Inc., New York, N.Y. 1964, Part 2, Chapter 1 and 2.
- Worral, D. E., The action of hydroxylamine and of hydrazine on the aryl monothio-amides of ethyl acetylmalonate. *J. Amer. Chem. Soc.*, 44, 1551-1557 (1922).