Journal of Chemistry, Vol. 48 (5), P. 529 - 533, 2010

CONDENSATION OF 4-AMINO-3-(2-METHOXY-4-PROPYLPHENOXYMETHYLENE)-(1H)-1,2,4-TRIAZOLE-5-THIONE WITH SOME HETEROCYCLIC ALDEHYDES

Received

NGUYEN HUU DINH, NGUYEN HIEN

Department of Chemistry, Hanoi University of Education

ABSTRACT

A series of 6 imines were synthesized by condensing 4-amino-3-(2-methoxy-4-propylphenoxymethylen)-(1H)-1,2,4-triazole-5-thione with heterocyclic aldehydes. The structure of the imines were confirmed by UV, IR, ^{1}H NMR and ^{13}C NMR spectroscopy, in some cases, 2D NMR spectra are also used.

I - INTRODUCTION

During the last two decades, substituted 1,2,4-triazole and their derivatives are among the various heterocycles that have received considerable attention from chemists. Many have been used commercially as pharmaceuticals, pesticides and dyestuffs. Typical examples are raxil (1-(triazol-1-yl)-2-hydroxy-2-tertbutyl-4-(4-chloropphenyl)butane), a fungicide used for plant protection; fluconazole (1,3-(bistriazol-1-yl)-2-hydroxy-2-(2,4-diflorophenyl) propane), a drug used to treat fungal infection; amizole (3-amino-1,2,4-triazole), a herbicide used as a herbicide [1, 2]. On other hand, amino-1,2,4-triazoles are an object for recyclization from five-membered ring to six-membered ring [3]. It is our interest to combine the 1,2,4-triazole ring with a moiety of eugenol and to study spectroscopic and biological properties of the products.

In previous paper [4] we reported on the preparation and structure of 4-amino-3-(2-methoxy-4-propylphenoxymethylen)-(1H)-1,2,4-triazole-5-thione starting from eugenol, herein some imines derived from this compound are described.

II - EXPERIMENTAL

• *4-amino-3-(2-methoxy-4-propylphenoxymethylen)-(1H)-1,2,4-triazole-5-thione (**A**).*

This compound was prepared according to the method reported in reference [4].

• *General procedure for preparation of imines A1÷A6:*

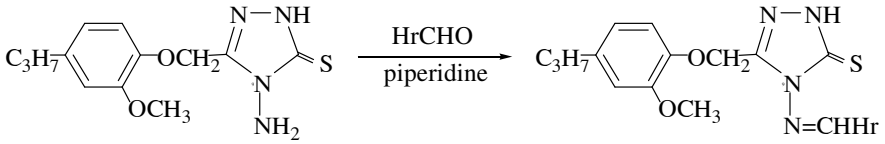
A mixture of A (0.72 g, 2.5 mmole), an aromatic aldehyde (2.5 mmole) and 2-3 drops of piperidine in a minimum amount of ethanol was refluxed for 12 ÷ 14 hours. The reaction mixture was allowed to cool to room temperature and then was evaporated until a precipitate formed. The precipitate was filtered, washed with cool ethanol and recrystalized from ethanol or methanol. The results are given in table 1.

• *The IR spectra* were recorded in KBr discs at 400-4000 cm^{-1} on a *FTS 60000 Bio-Rad*. The UV spectra were recorded on a *GCB Instrument-2855* spectrophotometer. The NMR spectra were obtained at room temperature on a

Bruker Avance 500 MHz spectrometer in d_6-*DMSO* with TMS as the internal standard.

III - RESULTS AND DISCUSSION

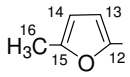
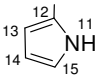
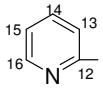
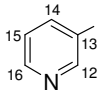
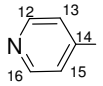
The reported compounds were prepared from 4-amino-3-(2-methoxy-4-propylphenoxymethylen)-(1H)-1,2,4-triazole-5-thione (**A**) as following:



(A) **(A1 - A6)**

Results of synthesis of imines A1÷A6 are given in table 1.

Table 1: Results of synthesis and UV-absorption of imines A1 ÷ A6

Compd.	Hr,*	Solvent for recrystn.	Color and form	Yield (%)	M.p. (^{0}C)	UV, λ_{max}(nm)/lgε
A1		Ethanol	yellow needle crystals	43	137-9	228/sh.8**; 250/4.01; 295/3.80; 340/sh.
A2		Ethanol	yellow crystals	35	114-5	230/sh.; 252/4.06; 299/3.81; 342/sh.
A3		Methanol	yellow needle crystals	40	213-4	228/sh.; 251/4.57; 286/4.20; 341/4.28
A4		Ethanol	yellow crystals	50	153,5	242/4,22; 278/sh.; 345/3.44
A5		Ethanol	yellow crystals	62	141-2	243/4.46; 282/4.25; 310/4.05; 324/3.92
A6		Ethanol	yellow crystals	78	226	240/4.24; 280/sh.; 344/3.45

*The numerotion is special for an analysis of NMR; **sh: shoulder.

The longest absorption band (340 - 345 nm) of A1 - A6 is wide and reaches to 400 nm, therefore A1 - A6 are colored.

The main IR bands of A1 - A6 are listed in table 2.

The disappearance of bands at 3332 and 3206 cm^{-1} on IR spectra of the imines shows good agreement with the condensation reaction, in which the amino group of compound **A** become the imine group. The bands at 3060 - 3105 cm^{-1}, corresponding to the stretching vibration of triazole NH group, indicate that compounds of A1 - A6 exist most the time in (1H)-1,2,4-triazole-5-thione form, but does not tautomerize into 3-mercapto-1,2,4-triazole form. For A3, the band at 3356 cm^{-1} belongs to

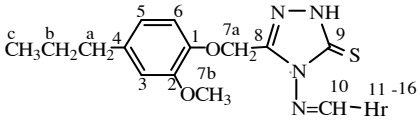
stretching vibration of pyrrole NH group.

The chemical shifts of protons in 3-(2-methoxy-4-propylphenoxymethylen)-(1H)-1,2,4- triazole-5-thion moiety (amino moiety) of A1 - A6 small change from one to another, so they are briefly listed as in Table 3.

Table 2: IR bands of studied compounds

Compd.	IR, cm^{-1}				
	ν_{NH}	ν_{CH} (aromatic)	ν_{CH} (saturated)	$\nu_{C=C}$ $\nu_{C=N}$	ν_{C-O}
A	3332; 3206	3030	2948; 2862	1601; 1600; 1517	1261; 1222
A1	3094	3035	2921; 2852	1590;1521;1485	1250; 1212
A2	3098	3041	2927; 2862	1589;1522;1491	1257;1208
A3	3356; 3105	3048	2919; 2869	1608; 1520; 1502	1250; 1220
A4	3060	3005	2950; 2915; 2860	1604; 1584; 1510	1260; 1222
A5	3062	3000	2955; 2933; 2869	1602; 1515; 1540	1250; 1223
A6	3062	3005	2950; 2919;2862	1602;1589; 1514	1263; 1220

Table 3: ^{1}H NMR signals of amino moiety, δ (ppm), J (Hz)



H3	**H5**	**H6**	**H7a**	**H7b**	**Ha**	**Hb**	**Hc**	**NH**
6.73÷6.75 d; J 2	6.63÷6.65 dd; J 8; 2	6.92÷6.93 d; J 8	5.08÷5.19 s	3.64÷3.68 s	2.38÷2.46 t; J 7.5	1.48÷1.55 m	0.82÷0.87 t; J 8	13.92 ÷ 14.19; s

In contrast, the chemical shifts and the splitting patterns of the aldehyde moiety were much change from one to another (table 4). In many cases, the assignment of proton signals must base on 2D NMR spectra such as HSQC and HMBC. For example, three signals H13, H14, H15 of A3 are complicated multiples, they were assigned by using HSQC spectrum (Fig. 1) and then HMBC spectrum (Fig. 2).

The signals for imine proton (H10) of A1-A6 appear as a singlet at 9.24 - 10.23 ppm, while the chemical shift for imine protons of various series of azomethine and hydrazone usually smaller than 9.0 ppm [5 - 7]. It is possible that C=S group of A1-A6 cause down-field shifts for the neighboring imine proton.

The assignment of the ^{13}C NMR signals in many cases bases on both their chemical shifts and their *2D* spectrum data. For example, the ^{13}C NMR signals of compound A3 are assigned as in figure 1. In amino moiety of A1-A6, the chemical shifts for C1÷C9, Ca, Cb and Cc small change from one to another compound, so they are briefly listed as in table 4.

Because of the signals of the protons H3, H5, H6, H7a, H7b, Ha, Hb, Hc and H10 are always assigned unambiguously (table 3), using HSQC spectrum (Fig. 1), the signals of C3, C5,

Table 4: ^{1}H NMR signals of aldehyde moiety, δ (ppm), J (Hz) (see the numeration in table 1)

Compd.	H10	H13	H14	H15	H16	Others
A1	9.57; s	7.12; d; J 3.5	6.71; dd; J 3.5; 1	7.96; d; J 1	-	-
A2	9.48; s	6.42; dd; J 3.5; 1	7.22; d; J 3.5	-	2.40; s	-
A3	9.24; s	6.80; m	6.28; m	7.17; m	-	H11: 11.91; s
A4	10.27, s	7.86; d; J 7.5	7.95; t; J 7.5	7.52; t; J 5.5	8.72; d; J 5	-
A5	10.08; s	-	8.21; dt; J 8; 2	7.55; dd; J, 8; 5	8.76; dd; J 5; 2	H12: 8.97; d; J 1.5
A6	10.23, s	7.74; d; J 5.5	-	7.74; d; J 5.5	8.74; d; J 5.5	H12: 8.74; d; J 5.5

Table 4: ^{13}C NMR signals of amino moiety of examined compounds, δ (ppm)

C1	C2	C3	C4	C5	C6
144.6÷144.8	149.6÷149.8	112.6÷112.7	136.9÷137.2	119.9÷120.1	36.8÷36.9

C7a	C7b	C8	C9	Ca	Cb	Cc
60.8÷61.2	55.3÷55.4	146.8÷147.6	161.9÷162.1	36.8÷36.9	23.9÷24.1	13.6

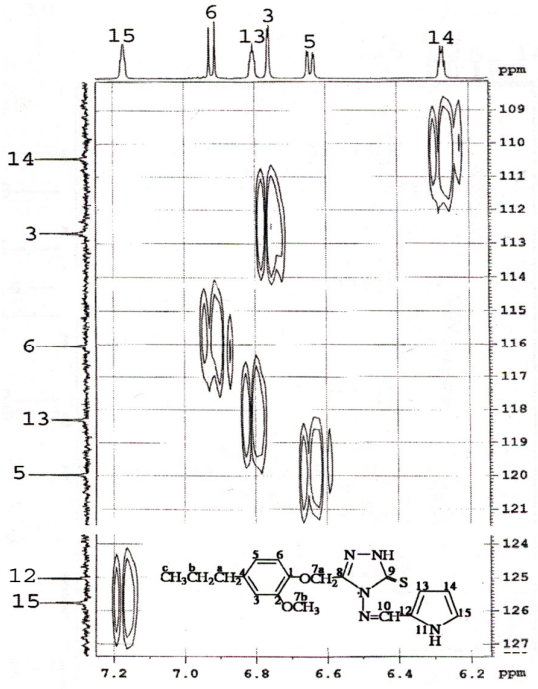


Fig. 1: A part of HSQC spectrum of A3

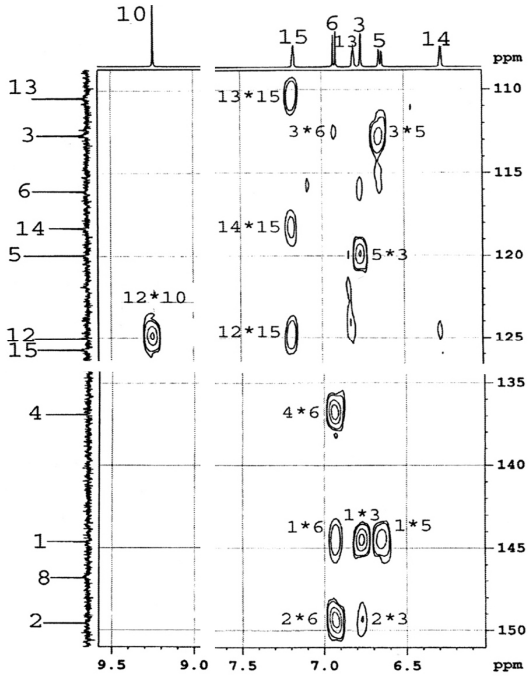


Fig. 2: A part of HMBC spectrum of A3

C6, C7, Ca, Cb, Cc and C10 are easily determined. In Fig. 2, the cross peak (12∗10) of H10 (*9.24 ppm*) shows that signal at 125.04 ppm is belonged to C12; the cross peaks (12∗15) of C12 shows that signal at 7.17 ppm is belonged to H15; the cross peaks (13∗15), (14∗15) of H15, in turn, show signals of C13, C14; and so all .... Returning to Fig. 1, the cross peaks of H13, H14 and H15 allow to identify the C13, C14 and C15. The chemical shifts of C10 ÷ C16 in aldehyde moiety of A1-A6 are listed in table 5.

Table 5: ^{13}C NMR signals of C10 - C16 of examined compounds, ppm

Compd.	**C10**	**C12**	**C13**	**C14**	**C15**	**C16**
A1	151.70	147.78	118.16	112.85	147.21	-
A2	152.51	145.65	109.68	122.48	158.10	13.62
A3	156.43	125.04	118.31	110.44	125.77	-
A4	161.0	152.13	131.30	134.83	124.26	150.41
A5	160.54	149.88	128.08	134.88	124.07	152.94
A6	159.51	150.56	121.84	139.28	121.84	150.56

REFERENCES

1. T.L. Gilchrist. Heterocyclic Chemistry. Longman Scientific & Technical, 294 (1993).
2. Xiao-Wen Sun, Xin-Ping Hui, Chang-Hu Chu & Zi-Yi Zhang. Indian Journal of Chemistry, Vol. 49B, 15 - 19 (2001).
3. Louis E. Benzamin and R. Harry. J. Het. Chem., Vol. 13, 1115-8 (1976).
4. Nguyen Huu Dinh, Duong Quoc Hoan, Nguyen Hưu Cảnh, Nguyen Hien, Đoan Thi Lan Hương. Vietnam Journal of Chemistry, Vol. 43 (4), 437 - 441 (2005).
5. Đặng như Tại, Triệu Quý Hùng. Tuyển tập các công trình Hội nghị KH và CN hoá hữu cơ toàn quốc lần thứ 2, Hà nội 12/2001, trang 1-5.
6. Tran Quoc Son, Pham Quoc Toan. Vietnam Journal of Chemistry, Vol. 43 (1), 27 - 31 (2005).
7. Nguyen Huu Dinh, Ngo Thi Ly, Pham Van Hoan. Journal of Heterocyclic Chemistry, Vol. 43, 1657 - 1663 (2006).

Corresponding author: **Nguyen Huu Dinh**
Department of Chemistry, Hanoi University of Education
142 Xuan Thuy, Quan Hoa, Cau Giay Distric, Hanoi, Vietnam
Email: nguyenhuudinh1954@yahoo.com

Ngưng tụ 4-Amino-3-(2-metoxy-4-propylphenoxymetilen)-(1H)-1,2,4-triazole-5-thion với một vài anđehit dị vòng.

Nguyễn Hữu Đĩnh, Nguyễn Hiển

Sáu hợp chất loại imin chứa vòng 1,2,4-triazole đã được điều chế bằng cách ngưng tụ 4-amino-3-(2-metoxy-4-propylphenoxymetilen)-(1H)-1,2,4-triazole-5-thion với một vài anđehit dị vòng. Cấu tạo của các hợp chất đã được xác định nhờ phổ UV, IR, ^{1}H NMR, ^{13}C NMR, trong một số trường hợp đã sử dụng phổ 2D NMR.