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A facile synthesis, characterization and spectral studies of new substituted phenyl malonamic acid hydrazides and their acid hydrazones

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ABSTRACT

Several new acid hydrazones have been synthesized by the condensation of newly synthesized substituted phenyl malonamic acid hydrazides with different substituted aldehydes and ketones. The identity of prepared compounds were characterized on the basis of elemental analysis and their spectral studies.

Key words: Synthesis, Acid hydrazides, Acid hydrazones and IR Spectral studies.

INTRODUCTION

Acid hydrazides represent a class of compounds having the great therapeutic value, cyano-acetic acid hydrazide[1] has been used in the treatment of husk or lung worm in mammals, benzylidine[2] hydrazides were reported as CNS active and anti-inflammatory agents, acid hydrazides have also been found to possess anthelmintic[3-4], antidiabetic[5] and antitumor[6] activities, A radioiodinated hydrazide[7] showed good localization in tumor tissues when injected into mice bearing human cancer zerografts.

Different condensation products of a number of hydrazides with various substituted aromatic aldehydes and ketones were also examined[8] with a view for reducing the toxicity due to free amino group in acid hydrazides .

Hydrazones have also been found to possess anti-bacterial,[9-10] antifungal,[11] antiviral[12] as well as insecticidal activity,[13] some substituted hydrazones have been shows the acetyl choline strease inhibitory activity,[14] hydrazones have proved their application in analytical chemistry, they have been used as chelating agents for the quantitative estimation of transition metal ions,[15] hydrazones have also gained commercial significance as charge transporting agents in electro photographic photoreceptors.[16] In this laboratory also a number of acid hydrazides and acid hydrazones have been prepared.[17-21]

The present work deals with the condensation of different substituted aromatic aldehydes and ketones with N-(R) phenyl malonamic acid hydrazides (1a, 3a). The condensation took place readily in alcoholic medium and 14 new acid hydrazones were prepared.

EXPERIMENTAL

Material

Melting points was determined in open capillary tubes by Electro thermal apparatus and were uncorrected. All synthesized compounds were recrystallised from absolute ethanol, TLC was run on silica-gel-coated Al plates (Merck),using 20% benzene / methanol as developing solvent it checked the purity of all the synthesized compounds, IR spectra were recorded in KBr on a Perkin-Elmer spectrum RX-1 FT-IR spectrophotometer at St. John's College, Agra. All the chemicals used in the synthesis were obtained from Sigma-Aldrich company.

Table : 1 Analytical & Physical data of the Synthesized Compounds (1a, 3a, 2a-2g, 4a-4g)

Compounds Code	Colour	Yield %	M.P (°C)	Molecular Formula	Molecular Weight	% Analytical data C Cal. %	C (Found)	H Cal. %	H (Found)	N Cal. %	N (Found)
1a	White	56.30	158	$C_{10}H_{12}N_3O_3Cl_1$	257.68	46.61	(46.65)	4.69	(4.70)	16.30	(16.33)
2a	Brown	68.11	189	$C_{15}H_{15}N_3O_4Cl_1$	336.76	53.49	(53.51)	4.49	(4.47)	12.48	(12.52)
2b	White	64.40	190	$C_{18}H_{19}N_3O_5Cl_1$	392.83	55.03	(55.04)	4.87	(4.89)	10.69	(10.73)
2c	Creamish	52.44	195	$C_{18}H_{19}N_3O_3Cl_1$	360.83	59.91	(59.93)	5.30	(5.32)	11.64	(11.62)
2d	White	57.51	196	$C_{17}H_{16}N_3O_3Cl_2$	381.25	53.55	(53.59)	4.23	(4.24)	11.02	(11.04)
2e	White	88.74	201	$C_{17}H_{17}N_3O_4Cl_1$	362.80	56.28	(56.31)	4.72	(4.70)	11.58	(11.62)
2f	White	41.59	189	$C_{17}H_{16}N_3O_3Cl_2$	381.25	53.55	(53.57)	4.23	(4.22)	11.02	(11.05)
2g	White	44.50	193	$C_{17}H_{17}N_3O_3Cl_1$	346.80	58.87	(58.85)	4.94	(4.97)	12.11	(12.10)
3a	White	44.23	129	$C_{11}H_{15}N_3O_3$	237.26	55.68	(55.72)	6.37	(6.38)	17.71	(17.75)
4a	Yellowish White	40.38	169	$C_{18}H_{20}N_3O_4$	342.38	63.14	(63.18)	5.88	(5.86)	12.27	(12.29)
4b	Yellowish White	51.14	209	$C_{18}H_{19}N_4O_5$	371.38	58.21	(58.19)	5.15	(5.16)	15.08	(15.12)
4c	White	56.92	235	$C_{18}H_{19}N_3O_4Cl_1$	376.83	57.37	(57.39)	5.08	(5.09)	11.15	(11.19)
4d	White	84.69	219	$C_{18}H_{19}N_3O_3Cl_1$	360.83	59.91	(59.89)	5.30	(5.32)	11.64	(11.61)
4e	Paleish White	58.05	231	$C_{18}H_{18}N_3O_4Cl_2$	411.28	52.56	(52.60)	4.41	(4.42)	10.21	(10.23)
4f	White	62.80	209	$C_{18}H_{20}N_3O_4$	342.38	63.14	(63.17)	5.88	(5.90)	12.27	(12.30)
4g	White	65.72	208	$C_{18}H_{20}N_3O_3$	326.38	66.24	(66.28)	6.17	(6.19)	12.87	(12.89)

The identity of newly synthesized compounds was confirmed by M.P, Elemental analysis, IR spectral data. The analytical data, colour, melting point, yield %, molecular weight, molecular formula are recorded in Table -1.

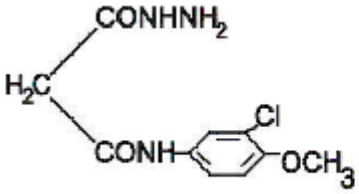
The General method of the synthesis of N-(R) phenyl malonamic acid hydrazides (1a,3a)

The substituted aniline (3-chloro -4-methoxy,2-methoxy-5-methyl ; 0.025 mole) & diethyl malonate (0.05 mole) was added with dimethyl formamide as a catalyst and refluxed to gentle ebullition for 45-60 minutes, After cooling ethanol (20ml) was added, and the filtrate was concentrated over a water-bath, then the solution was treated with ethyl alcohol (20ml) and hydrazine hydrate 99%. The mixture was set a side and the solid separated, was recrystallised from hot ethanol, and was identified N-(R) phenyl malonamic acid hydrazides (1a,3a). **(R)**=3-chloro-4-methoxy aniline, 2-methoxy-5 methyl aniline

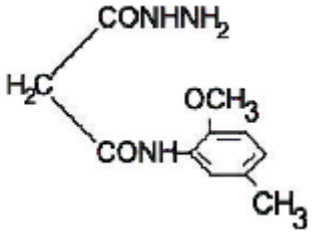
General procedure for the synthesis of acid hydrazone (2a-2g, 4a-4g)

To (1a,3a ; 0.001 mole) dissolved in absolute ethanol (10ml) and ($R^{\acute{y}}$) substituted aldehyde or ketone (0.001 mole) was refluxed for 2 hours,solid obtained on cooling was recrystallised from absolute ethanol.

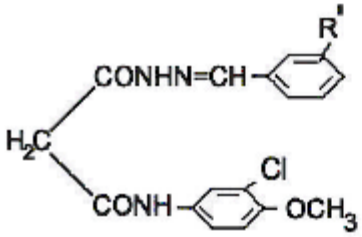
Structures of Acid hydrazides & Acid hydrazones in general is furnished in the following manner.



N-(3-chloro -4-methoxy) phenyl malonamic acid hydrazide **(1a)**



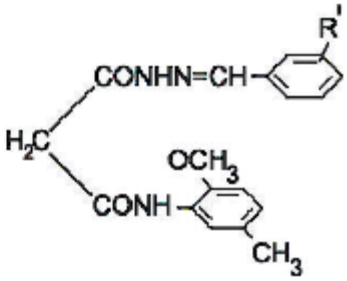
N-(2-methoxy-5-methyl) phenyl malonamic acid hydrazide **(3a)**



N - (3-Chloro-4-methoxy) phenyl malonamic acid hydrazone of (R')- substituted aldehyde or ketone

(2a-2g)

R' - Furfuraldehyde **(2a)**
- Vanillin **(2b)**
- Acetophenone **(2c)**
- 2- Chloro Benzaldehyde **(2d)**
- Salicylaldehyde **(2e)**
- 4- Chloro Benzaldehyde **(2f)**
- Benzaldehyde **(2g)**



N-(2-methoxy-5-methyl) phenyl malonamic acid hydrazone of (R')- substituted aldehyde or ketone

(4a-4g)

R' - 4 - Hydroxy Benzaldehyde **(4a)**
- 2 - Nitro Benzaldehyde **(4b)**
- 5 - Chloro Salicylaldehyde **(4c)**
- 2 - Chloro Benzaldehyde **(4d)**
- 3, 5 - Di-Chloro Salicylaldehyde **(4e)**
- Salicylaldehyde **(4f)**
- Benzaldehyde **(4g)**

Table 2: Characterization data of Synthesized Compounds (1a,2a-2c,3a,4a-4c)

Compounds Code	IR (Vibrations in cm^{-1})
1a	1640 (CONH), 3284 (NH), 2357 (N=CH), 684 (C-Cl)
2a	1650 (CONH), 3206 (NH), 2357 (N=CH), 672 (C-Cl)
2b	1638 (CONH), 3415 (NH), 2360 (N=CH), 668 (C-Cl)
2c	1686 (CONH), 3445 (NH), 2361 (N=CH), 671 (C-Cl)
3a	1683 (CONH), 3420 (NH), 2360 (N=CH), 668 (C-Cl)
4a	1640 (CONH), 3417 (NH), 2361 (N=CH), 613 (C-Cl)
4b	1681 (CONH), 3442 (NH), 2352 (N=CH), 681 (C-Cl)
4c	1684 (CONH), 3287 (NH), 2347 (N=CH), 650 (C-Cl)

RESULTS AND DISCUSSION

The infrared spectra of the synthesized acid hydrazides and acid hydrazones have been recorded in frequency region 4000-450 cm -1 , in the Table 2. The IR spectrum of N-(3-Chloro-4-methoxy) phenyl malonamic acid hydrazide[1a] shows -NH stretching vibrations at 3284 cm-1,-CONH stretching vibrations at 1640 cm-1,and -N=CH stretching vibrations at 2357 cm-1,C-Cl stretching vibrations at 684 cm-1 .These observations are support to assigned the structure of compound No. **1a**.

And IR spectrum of N-(2-methoxy-5-methyl) phenyl malonamic acid hydrazide[3a] reveals -NH stretching vibrations at 3420 cm^{-1},-CONH stretching vibrations at 1683 cm^{-1} and -N=CH stretching vibrations at 2360 cm^{-1} ,C-Cl stretching vibrations at 668 cm^{-1}. These observations are support to assigned the structure of compound No. **3a**.

The IR spectrum of N-(3-Chloro-4-methoxy) phenyl malonamic acid hydrazone of furfuraldehyde[2a] show -CONH stretching vibrations at 1650 cm-1 ,NH stretching vibrations at 3206 cm-1 ,N=CH stretching vibrations at 2357 cm-1 ,C-Cl stretching vibrations at 672 cm-1 and the IR spectrum of N-(2-methoxy-5-methyl) phenyl malonamic acid hydrazone of 4-hydroxy benzaldehyde[4a] reveals-CONH stretching vibrations at 1640 cm-1 , -NH stretching vibrations at 3417cm-1 ,-N=CH stretching vibrations at 2361cm-1 ,C-Cl stretching vibrations at 613 cm-1.These observations are support to assigned structure of compounds No. **2a**,**4a**.

The above observations are agreed with assigned structure of all the mentioned compounds No. 2b-2c&4b-4c and other compounds No. (2d-2g&4d-4g).

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