Synthesis and Characterization of 3-Coumaryl-4-Aroyl-5-Aryl Pyrazolines

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New 3-(4-methyl-7-hydroxy coumaryl)-4-(4′-methoxy benzoyl)-5-aryl pyrazolines (**4a–i**) have been synthesised by the action of hydrazine/isoniazid/semicarbazide, with 2-aryl-3-[4-methoxy benzoyl]-5,6-[4-methyl-7,8-coumaryl] flavanones (**3a–c**) in pyridine medium.

INTRODUCTION

A five-membered ring containing adjacent nitrogen atoms is known as pyrazole and its dihydro form is known as pyrazoline. Pyrazolines are found to be bactericidal[1], fungicidal and insecticidal[2, 3] agents. Some pyrazolines are also reported as anti-inflammatory, antidiabetic, anaesthetic and analgesic properties[4–7]. Certain pyrazoline derivatives are found effective for killing the house flies on contact.[8]

Pyrazolines can be synthesised by the action of hydrazine or phenyl hydrazine on chalcones and flavanones, in different solvents like acetic acid, pyridine, ethanol, DMSO etc.[9] From the survey of literature, it is clear that 3-coumaryl-4-aroyl-5-aryl pyrazolines (**4a–i**) have not been yet synthesised. It was, therefore, thought of interest to synthesise coumaryl pyrazolines.

The present work deals with the synthesis of 3-(4-methyl-7-hydroxy coumaryl)-4-(4′-methoxy benzoyl)-5-aryl pyrazolines (**4a–i**) by the action of hydrazine/isoniazid/semicarbazide with 2-aryl-3-[4-methoxy benzoyl]-5,6-[4-methyl-7,8-coumaryl] flavanones in pyridine as a medium. The structures of these compounds have been established on the basis of elemental analysis and spectral analysis.

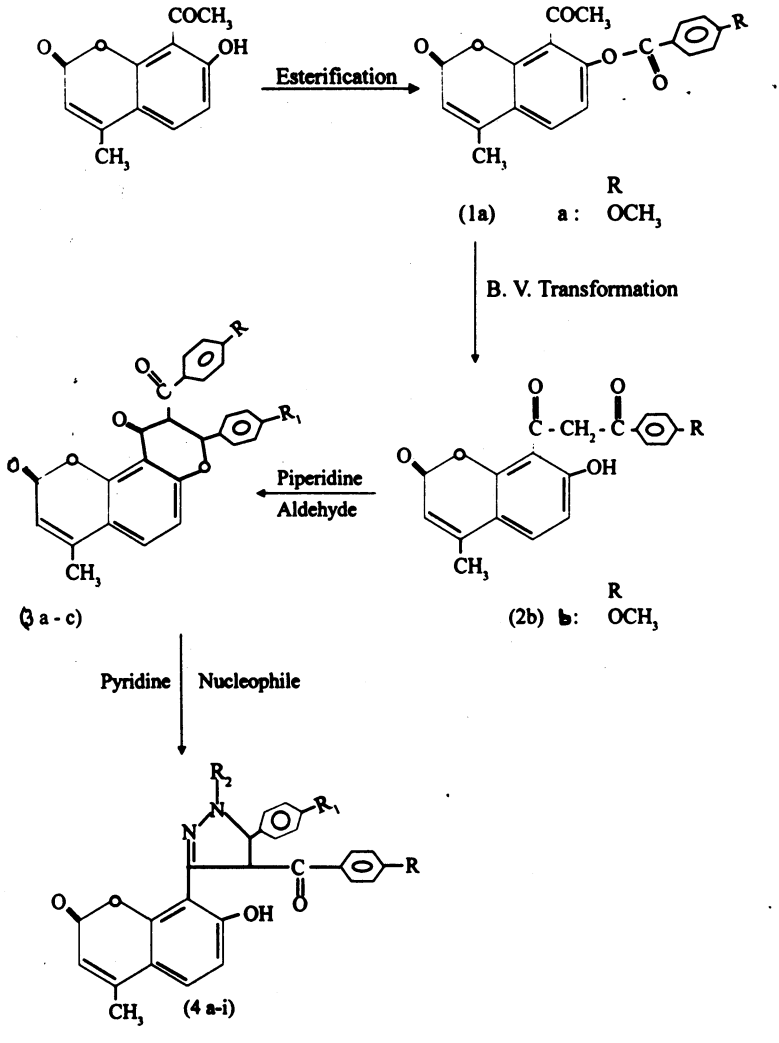
EXPERIMENTAL

All melting points were taken in silicon oil bath instrument in open capillary and are uncorrected. Purity of compound was checked by TLC on silica gel-G; IR-spectra was recorded on Perkin-Elmer spectrophotometer, PMR-spectra on Brucker Ac-300 FNMR spectrophotometer at 300 MHz and UV-spectra recorded on Shimadzu spectrophotometer. The nitrogen was estimated on Colman-N-analyser-29.

Preparation of Ester (1a): 4-Methyl-7-aroyloxy-8-acetyl coumarin (**1a**) is synthesised from 4-methyl-7-hydroxy-8-acetyl coumarin (0.04 mole), aromatic acid (0.04 mole) and dry pyridine (10 mL). This mixture was kept in an ice bath; to this ice-cold mixture $POCl_3$ (3 mL) was added slowly with constant stirring.

The reaction mixture was kept for 7 h at room temperature, then poured over crushed ice containing conc. HCl; the solid obtained was filtered, washed with $NaHCO_3$ (2%) followed by water and crystallized from acetic acid.

Preparation of 1-coumaryl-3-aryl propane-1,3-dione (2b): Ester **(1a)**



Scheme

(0.04 mole), dry pyridine (10 mL) and pulverised KOH (3.4 g) were mixed and the reaction mixture was kept overnight. It was then acidified with ice-cold HCl (1 : 1); the yellow solid obtained was separated, washed with $NaHCO_3$ (2%) followed by water and crystallized from ethanol-acetic acid mixture.

Preparation of 2-aryl-3-[4-methoxy benzoyl]-5,6-[4-methyl-7,8-coumaryl] flavanones (3a–c): 1-Coumaryl-3-aryl propane-1,3-dione (**2b**) (0.01 mole) was refluxed with benzaldehyde/anisaldehyde/*p*-hydroxy benzaldehyde (0.02 mole) and piperidine 2 to 3 drops for 1/2 h in DMF solvent. Reaction mixture was poured in water containing little conc. HCl to neutralise piperidine. The product was filtred and washed with water and crystallized from acetic acid. The physical characteristics are given in Table 1

TABLE-1
PHYSICAL DATA OF SYNTHESIZED COUMARYL FLAVANONES

Compounds	R	R_1	m.p. (°C)	yield (%)	m.f.
3a	—OCH_3	—H	258–260	72	$C_{27}H_{20}O_6$
3b	—OCH_3	—OCH_3	255–257	68	$C_{28}H_{22}O_7$
3c	—OCH_3	—OH	257–260	70	$C_{27}H_{20}O_7$

Preparation of 3-coumaryl-4-aroyl-5-aryl pyrazolines (4a–i): 2-Aryl-3-[4-methoxy benzoyl]-5,6-[4-methyl-7,8-coumaryl] flavanones (**3a–c**) (0.01 mole) were refluxed with isoniazid/hydrazine/semicarbazide (0.02 mole) for 8 h in pyridine as a solvent. The reaction mixture was decomposed by acidified water. The product obtained was filtered, washed with water and crystallized from acetic acid. The physical characteristics of compounds (**4a–j**) are given in Table-2.

TABLE-2
PHYSICAL DATA OF SYNTHESISED COUMARYL PYRAZOLINES

Com-pounds	R	R_1	R_2	m.p. (°C)	yield (%)	m.f.	N% found (Calc.)
4a	—OCH_3	—H	—COC_5H_4N	> 270	78	$C_{33}H_{25}N_3O_6$	7.49 (7.51)
4b	—OCH_3	—H	—H	250–252	83	$C_{27}H_{22}N_2O_5$	6.10 (6.16)
4c	—OCH_3	—H	—$CONH_2$	> 270	80	$C_{28}H_{23}N_3O_6$	8.35 (8.45)
4d	—OCH_3	—OCH_3	—COC_5H_4N	> 270	65	$C_{34}H_{27}N_3O_7$	7.10 (7.13)
4e	—OCH_3	—OCH_3	—H	> 270	80	$C_{28}H_{24}N_2O_6$	5.70 (5.78)
4f	—OCH_3	—OCH_3	—$CONH_2$	260–262	70	$C_{29}H_{25}N_3O_7$	7.90 (7.96)
4g	—OCH_3	—OH	—COC_5H_4N	> 270	75	$C_{33}H_{25}N_3O_7$	7.25 (7.30)
4h	—OCH_3	—OH	—H	> 270	82	$C_{27}H_{22}N_2O_6$	5.92 (5.95)
4i	—OCH_3	—OH	—$CONH_2$	> 270	85	$C_{28}H_{23}N_3O_7$	8.15 (8.18)

Spectral Interpretation of (3b): IR (ν_{max}) (cm^{-1}): 3081 (Ar, C—H), 2836 ν(C—H), 1906, ν(C=O), 1500–1433 ν(C=C), 1257 ν(C—O—C), 1029 ν(C—O—C); PMR ($CDCl_3$) δ ppm: 2.4 (S, 3H, —CH_3), 3.7 (S, 6H, —OCH_3), 5.3 (d, 1H), 5.9 (d, 1H), 6.8 (d, 1H, Ar—H), 7.0 (d, 1H, Ar—H), 7.2 (S, 1H, Ar—H), 7.3 (d, 2H, Ar—H), 7.5 (d, 2H, Ar—H), 7.8 (d, 1H, Ar—H); UV (λ_{max}), 342 nm (n-π*).

Spectral Interpretation of (4a): IR (ν_{max}) (cm^{-1}): 3278 ν(—OH), 1877 ν(C=O), 1599 ν(C=N), 1225 ν(C=O); 811 (Sub. phenyl): 1507–1433 ν(C=C), 2834 ν(C—H), 1248 (C—O—C), 1032 ν(C—O—C); PMR ($CDCl_3$) δ ppm: 2.4 (S, 3H, —CH_3), 3.8 (S, 3H, —OCH_3), 3.6 (d, 1H, —CH), 6.5 (d, 1H, —CH), 6.9 (d, 1H, Ar—H), 7.0 (d, 1H, Ar—H), 7.3 (S, 1H, Ar—H), 7.4 (S, 5H, Ar—H), 7.5 (d, 4H, Ar—H), 7.7 (d, 2H, Ar—H), 7.8 (d, 2H, Ar–H), 8.0 (S, 1H, –OH); UV (λ_{max}): 361.8 nm (n-π*).

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