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Antimicrobial and Anthelmintic Activity of Pyrazolin-5-one Derivatives

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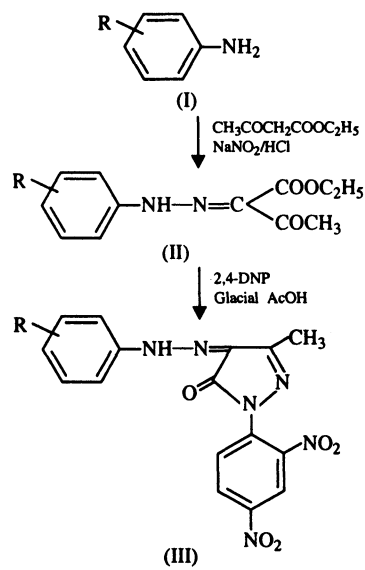
Some new 1-(2′,4′-dinitro phenyl), 3-methyl, 4-(aryl hydrazono)-2-pyrazolin-5-one were pepared by reacting with different ethyl 2-aryl hydrazono-3-oxybutyrate derivatives with 2,4-DNP. The products were screened for their antimicrobial and anthelmintic activities.

Key Words: Pyrazolin–5-ones, Antibacterial activity, Antifungal activity, Anthelmintic activity.

INTRODUCTION

Pyrazolin-5-one and its derivatives are potential biologically active compounds[1, 2]. 2-pyrazolin-5-one dérivatives have wide range of pharmaceutical properties cited in literature[3, 4]. With the new boost to drug activity we have synthesized some different pyrazolin-5-one dérivatives starting with different aryl amines and screened them for antimicrobial and anthelmintic studies. The structure of the compounds was confirmed on the basis of spectral data (IR, NMR studies) and elemental analysis. The compounds are prepared by the following **Scheme-I.**



Scheme-1

EXPERIMENTAL

Melting points were determined on Toshniwal apparatus and are uncorrected. The purity of the compounds was checked by TLC on silica-gel plates. IR spectra were recorded on Perkin-Elmer 817 spectrophotometer and PMR spectra on a Varian Em-360 L using TMS as internal standard.

Ethyl-2-aryl hydrazono-3-oxybutyrate(II)

To the aniline (0.01 mol) dissolved in a mixture of HCl (8 mL) and water (6 mL) and cooled to 0°C in ice bath, a cold aqueous solution of sodium nitrite (0.03 mol) was added. The diazonium salt solution was filtered in a cooled solution of ethylacetoacetate (0.01 mol) and sodium acetate (0.01 mol) in ethanol 50 mL. The resulting solid was washed with water and crystallized from EtOH/MeOH to yield 50–70% NMR, δ 7.1–7.9 (5H, m, ArH and NH), 4.4 (2H, q, OCH_2), 1.5 (3H, t, CH_3), 2.7 (3H, s, $COCH_3$); IR (KBr) (cm^{-1}): 3400 ν(NH), 2900 ν(CH_2), 1710 ν(C=O), 1510 ν(NH—N=C).

1-(2′,4′-Dinitro phenyl)-3-methyl-4-aryl hydrazono-2-pyrazolin-5-one (IIIa–j)

To the compound **II** (0.02 mol) dissolved in glacial acetic acid (20 mL), a solution of 2,4-DNP (0.02 mol) in glacial acetic acid (25 mL) was added and the mixture was refluxed overnight. The resulting solid was dried and crystallized from EtOH/MeOH NMR δ 9.6 (1H, s, NH—N=C), 7.1–7.7 (4H, m, ArH), 2.35 (3H, s, CH_3); IR max (KBr) (cm^{-1}): 3480 ν(NH), 1680 ν(C=O), 1550 ν(NH—N=C), similarly other compounds were prepared from different amines and the physical constants are given in Table-1.

Biological evaluation

All the compounds **(IIIa–j)** were screened for their antibacterial and antifungal activities using filter paper disc method[5]. Compounds were tested against different strains of bacteria like *Bacillus subtilis* (BS), *E. coli* (EC), *Shigella dysenteriae* (SD) and fungi like *Trichoderma viridae* (TV), *Aspergillus* sp. (AS), *Candida albicans* (CA). Filter papers soaked in 20 μg solution of the compounds in DMF were placed at the centre of the organism seeded agar plates (petri-dishes). The petri-dishes were incubated at 28°C for 32 h in case of bacteria and 37°C in case of fungi. The activities were noted by measuring the diameter of inhibition zone in mm. The results are standardized against gentamycin and griseofulvin under the same conditions.

The compounds were also tested for anthelmintic activity[6] against earthworms using piperizine hydrochloride as reference anthelmintic. The results of all the activities are shown in Table-2.

TABLE-1
ANALYTICAL DATA OF SYNTHESIZED COMPOUNDS

Comp (III)	R	m.p. (°C)	yield (%)	Elemental analysis %: Calcd. (Found)		
				N	C	H
a	H	163	82	52.17 (52.22)	3.26 (3.26)	22.82 (23.01)
b	*p*-NO_2	236	52	46.48 (46.72)	2.66 (2.64)	23.72 (23.68)
c	*m*-NO_2	205	61	46.48 (46.48)	2.66 (2.66)	23.72 (23.72)
d	*o*-NO_2	224	70	46.48 (46.51)	2.66 (2.66)	23.72 (23.70)
e	*p*-Cl	252	57	47.32 (47.28)	2.73 (2.71)	20.86 (20.85)
f	*p*-Br	264	43	42.95 (42.95)	2.46 (2.44)	18.79 (18.80)
g	*p*-CH_3	220	70	53.40 (53.40)	3.66 (3.71)	21.98 (21.92)
h	*o*-OCH_3	196	75	51.25 (51.25)	3.51 (3.48)	21.10 (21.10)
i	*p*-OCH_3	212	60	51.25 (51.22)	3.51 (3.56)	21.10 (21.04)
j	*p*-COOH	232	69	49.27 (47.27)	2.91 (2.86)	21.38 (21.44)
k	N,N-$(CH_3)_2$	270	40	54.54 (54.51)	4.04 (4.10)	24.24 (20.38)

RESULTS AND DISCUSSION

Among the synthesized compounds **III b–c, d** showed comparable activity against all tested bacteria and fungi. The compounds **III f, j** showed moderate activity against all tested bacteria and fungi. The compounds **III h, i** showed good activity only on the selected fungi TV. The compound **III e** also showed greater activity on the fungi CA and **III k** show maximum inhibition on the bacteria EC whereas other compounds showed variable activity.

All the compounds **III b–f** showed greater activity than of standard drug against earthworms. However, others were less active against earthworms. It may be concluded that the compounds **IIIf, i** are better bactericidal agents.

REFERENCES

1. M.L. Verbal and N.W. Elglacer, *J. Med. Chem.*, **11**, 411 (1968).
2. I.M. Roushdi, I.A.E. Sebai and N.S. Habib, *Egypt Phar. Sci.*, **16**, 407 (1975).
3. H.D. Troatman and L.M. Long, *J. Am. Chem. Soc.*, **70**, 3446 (1948).
4. M. Taimyana, *J. Pharm. Soc. Japan.*, **40**, 2422 (1967).
5. Robert Bailey and E.G. Scott, Diagnostic Microbiology, The C.V. Mosby Co., Saint Louis, p. 257 (1966)
6. Gaind, *Indian J. Pharm.*, **27**, 198 (1965).

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TABLE-2
BIOLOGICAL DATA OF COMPOUNDS III(a–j)

Comp. (III)	Antifungal activity						Antibacterial activity						Drug response to earthworm (4% sol.)	
	TV		AS		CA		BS		EC		SD		Paralytic time (min)	Lethal time (min)
	2%	4%	2%	4%	2%	4%	2%	4%	2%	4%	2%	4%		
a	+	++	–	–	++	+++	–	–	–	–	+	++	16.5	23.5
b	++	+++	+	++	–	–	+	++	+	++	++	+++	5.0	7.0
c	++	+++	+	++	+	–	+	++	+	++	++	+++	4.5	8.5
d	++	+++	+	–	–	–	+	++	+	–	++	+++	5.0	8.0
e	–	–	++	+++	+++	++++	–	–	+	++	–	–	9.5	26.0
f	+	++	+	++	–	–	++	+++	+++	++++	++	++	8.0	19.5
g	+	–	+	++	+	++	–	–	++	+++	–	–	19.0	43.0
h	+++	++++	–	–	+	++	–	–	++	+++	–	–	22	38
i	+++	++++	–	–	+	++	–	–	++	+++	+	–	20.5	36.0
j	+	++	–	–	+	++	+++	++++	+++	+++	++	+++	22	52.0
k	+	–	+	++	–	+	+	++	+++	++++	–	+	15	34.0

TV = *Trichoderma viridie*, AS = *Aspergillus sp.*, CA = *Candida albicans*, BS = *Bacillus subtilis*, EC = *E. coli*, SD = *Shigella dysenteria*;
+ = 5–7, ++ = 8–12, +++ = 13–20, ++++ = 21–30 mm; – = not measurable activity/inactive.