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Synthesis and antifungal activity of 2-azetidinones, 4-thiazolidinones and 5-imidazolidinones incorporating benzthiazole moiety

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ABSTRACT

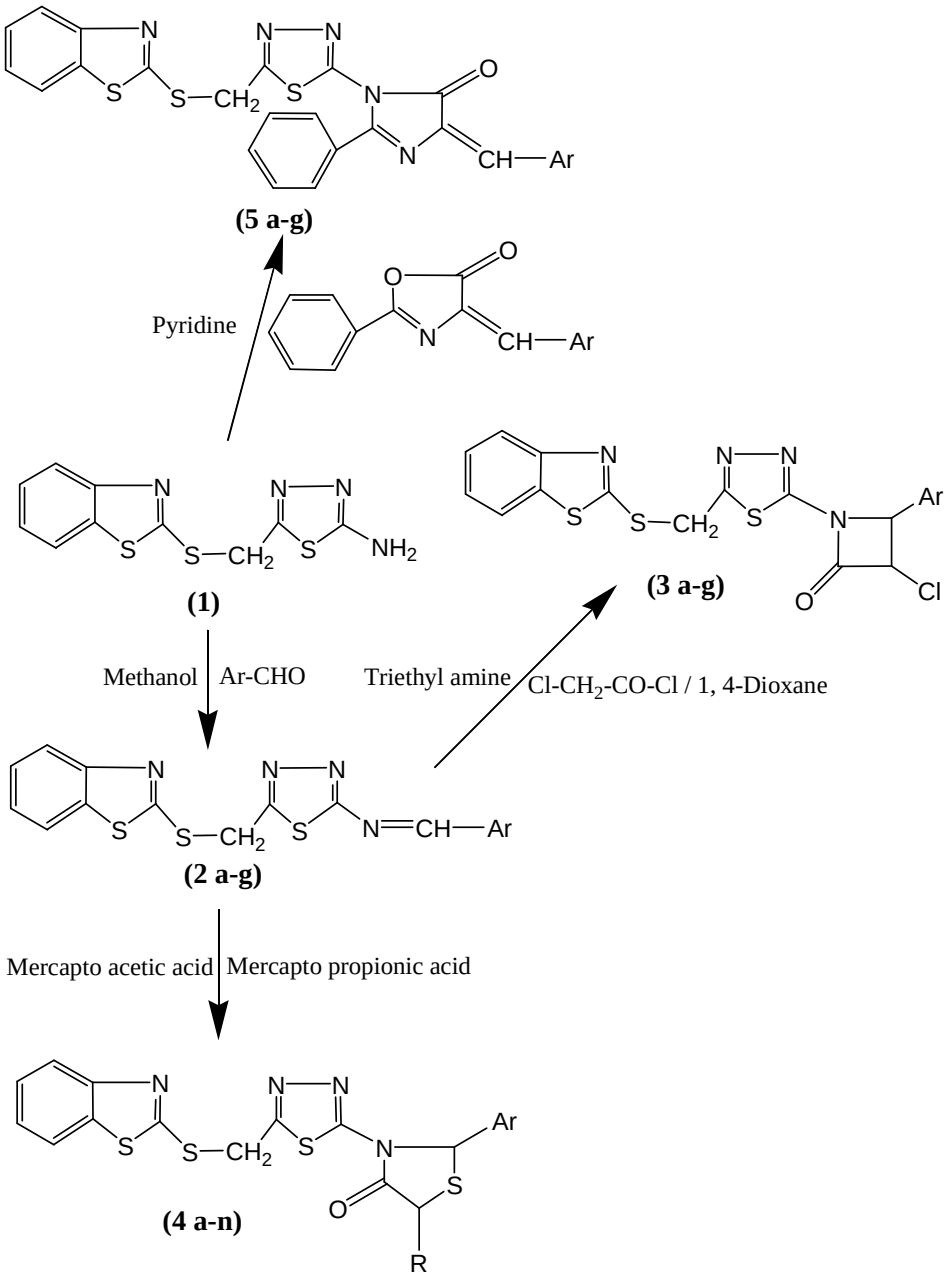
Starting material 2-amino-5-(benzthiazol-2[1]-yl-thiomethyl)-1, 3, 4-thiadiazole ***(1)*** *have been synthesized from easily available 2-carboxymethyl thio benzthiazole, thiosemicarbazide and phosphorous oxychloride. Compound* ***(1)*** *reacts with arylaldehyde and methanol gives 2-arylamino-5-(benthiazol-2[1]-yl-thiomethyl)-1, 3, 4-thiadiazole* ***(2 a-g)*** *were reacts with monochloroacetyl chloride and triethyl amine in dioxin to give 2-azetidinones* ***(3 a-g).*** *Compounds* ***(2 a-g)*** *were reacts with mercapto propionic acid / mercapto acetic acid to give 4-thiazolidinones* ***(4 a-n).*** *Compound* ***(1)*** *reacts with 2-phenyl-4-arylidene -5-oxazolone refluxed in pyridine to give 5-imidazolinones* ***(5 a-g).*** *Antifungal activity has been comparied with* ***Dithane M-45****, commercial fungicides, for their fungitoxic action against Phytophthora infestans and Collectotricum falcatum and the results correlated with their structural features.*

Keyword: Chemo selectivity, Azetidinones derivatives, Thiazolidinones derivatives, Imidazolidinones derivatives, Fungicidal Activity, Pharmacological properties, Infrared spectra, ^{1}H NMR spectra.

INTRODUCTION

Benzthiazoles, 1, 2, 4-thiadiazoles represents the most active classes of heterocyclic compounds possessing wide spectrum of biological activities i.e. pharmaceutical[1-5], antitubercular[6], antiinflammatory[7], anticancer[8], anthelmintic[9]. Many of the therapeutically useful compounds such as ethoxazolamides and thiacetazole are benzthiazoles and thiadiazoles documented as medicinal drugs[10]. So, it was thought that benzthiazole ring if coupled to 1, 3, 4-thiadiazole moiety, might possess enhanced antifungal, antibacterial, anti-inflammatory, antimicrobial and other activities. The reaction sequence leading to the formation of title compounds are given in **(Scheme-1)**.

2-Amino-5-(benzthiazol-2[1]-yl-thiomethyl)-1, 3, 4-thiadiazole **(1)** have been synthesized by the reaction of 2-mercapto-benzthiazole with chloroacetic acid in sodium hydroxide followed by the cyclocondensation with thiosemicarbazide in the presence of phosphous oxychlorides. The azomethines **(2 a-g)** were synthesized by the condensation of different types of aromatic aldehydes with **(1).** The azomethines **(2 a-g)** on cycloaddition reaction with monochloroacetyl chloride in presence of triethyl amine as a catalyst yielded 2-azetidinones **(3 a-g).** Where as cyclocondensation of azomethines **(2 a-g)** with 2-mercapto propionic acid / 2-mercapto acetic acid afforded 4-thiazolidinones **(4 a-n).** 5-Imidazolinones **(5 a-g)** were prepared by the condensation of compounds **(1)** with preformed azalactones[11]. The all synthesized new products were assigned the structures on the basis of elemental analysis and spectral (IR, ^{1}H NMR) data.



Ar: *a = C_6H_5; b = o-ClC_6H_4; c = p-ClC_6H_4; d = o-$OCH_3C_6H_4$; e = p-$OCH_3C_6H_4$; f = o- $CH_3C_6H_4$; g = p-$CH_3C_6H_4$.*
R: *a, b, c, d, e, f, g = CH_3; h, i, j, k, l, m, n = H.*

(Scheme-1)

EXPERIMENTAL SECTION

All melting point determined in open glass capillaries. All the solvents and reagents used were of Analytical grade. All the reactions were monitored by TLC using Benzene: Methanol (9: 2), Methylene dichloride: Ethyl acetate: Methanol (60: 35: 05) and Toluene: Ethyl acetate (7: 3) as a solvent system TLC plates were prepared by spreading method. These were dried in the air and then activated by heating in hot air oven at 110^0C for 30 minutes Iodine vapors were used for visualization of TLC plates. IR spectra in KBr were recorded on Perkin-Elmer infrared spectrophotometer (λ max in cm^{-1}) and ^{1}H NMR spectra in DMSO-d^6 on EM-360L (60MHz) NMR Spectrometer using TMS as internal references (Chemical shifts in δ ppm). All the compounds have given satisfactory elemental analysis (C, H, N, and S), IR and ^{1}H NMR spectra. 2-carboxymethyl thio-benzthiazole was prepared by following a reported method[12].

2-Amino-5-(benzthiazol-2^{1}-yl-thiomethyl)-1, 3, 4-thiadiazole (1)
A mixture of 2-Carboxymethyl thio-benzthiazole (0.01 M), thiosemicarbazide (0.01 M) and phosphorusoxychloride (7.0 ml) was refluxed in oil bath for 12.0 hrs. The content were poured on crushed ice and neutralized with 1.0% sodium bicarbonate solution. The product was filtered dried and crystallized from 1, 4-dioxane: methanol (3:1); m. p. 236^{0}C, yield 61%.

IR Spectra of Compound 1: IR (KBr): 3395 (N-H), 1685 (C=N), 720 (C-S-C) cm^{-1}.

2-Arylamino-5-(benzthiazol-2^{1}-yl-thiomethyl)-1, 3, 4-thiadiazole (2 a-g)
A mixture of **(1)** (0.01 M), arylaldehyde (0.01 M) and methanol (25.0 ml) was heated under reflux on water bath for 9.0 hrs. The contents were poured on crushed ice. The product was filtered, dried and crystallized from 1, 4-dioxane: methanol (3:1); yield, m. p, molecular formula and elemental analysis with IR and ^{1}H NMR spectra of the representative compounds are recorded in **Table-2**.

IR and ^{1}H NMR Spectra of Compound 2a: IR (KBr): 2910 (C-H), 1695 (C=N), 1680 (C-N), 1162(C-N), 685 (C-S-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 4.65 (s, 2H, -SCH_2), 7.6-8.0 (m, 9H, Ar- H), 8.15 (s, 1H, N=CH).

IR and ^{1}H NMR Spectra of Compound 2d: IR (KBr): 2925(C-H), 1695 (C=N), 1670 (C-N), 1160 (C-N), 690 (C-S-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 3.82 (s, 3H, -OCH_3), 4.68 (s, 2H, SCH_2), 7.1-7.8 (m, 8H, Ar-H), 8.18 (s, 1H, N=CH).

5-(Benzthiazol-2^{1}-yl-thiomethyl)-2-(4^{11}-aryl-3^{11}-chloro-2^{11}-azetidinon-1-yl)-1, 3, 4-thiadiazole (3 a-g)
Monochloroacetyl chloride (0.01 M) was added drop wise to compound **(2)** (0.01 M) and triethylamine (0.02 M) in 1, 4-dioxane (25.0 ml) at room temperature. The mixture was stirred for 8.0 hrs and left at room temperature for three days. The contents were filtered and poured on crushed ice. The product was filtered dried and crystallized from 1, 4-dioxane; all the synthesized compounds are given in **Table-2** with their characterization data.

IR and ^{1}H NMR Spectra of Compound 3a: IR (KBr): 2895 (C-H), 1695 (C=N), 1715 (C=O), 1615 (C-N), 675 (C-S-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 4.92 (s, 2H, SCH_2), 7.0-7.93 (m, 10H, Ar-H).

IR and ^{1}H NMR Spectra of Compound 3d: IR (KBr): 2885 (C-H), 1690 (C=N), 1725 (C=O), 1625 (C-N), 695 (C-S-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 3.83 (s, 3H, -OCH_3), 4.83 (s, 2H, SCH_2), 7.13-7.99 (m, 10H, Ar-H).

IR and ^{1}H NMR Spectra of Compound 3e: IR (KBr): 2880 (C-H), 1685 (C=N), 1720 (C=O), 1620 (C-N), 690 (C-S-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 2.42 (s, 3H, -CH_3), 4.88 (s, 2H, SCH_2), 7.10-8.05 (m, 10H, Ar-H).

5-Benzthiazol-2^{1}-yl-thiomethyl-2-(2^{11}-aryl-5^{11}-alkyl-4^{11}-thiazol-idinon-3^{11}-yl)-1, 3, 4-thiadiazoles (4 a-n)
A mixture of **(2)** (0.01 M) and mercapto propionic acid / mercapto acetic acid was heated at 120^{0} for 12 hrs. The reaction mixture was cooled and poured on crushed ice. The product was filtered, dried and crystallized from ethanol: water (2:1). Yield, m. p., molecular formula and elemental analysis with IR and ^{1}H NMR spectra of the representative compounds are recorded in **Table-3.**

IR and ^{1}H NMR Spectra of Compound 4c: IR (KBr): 2965 (C-H), 2855 (C-H), 1695 (C=O), 1615 (C=C), 1380 (C-S), 1095 (C-N), 685 (C-S-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 1.43-1.56 (d, 3H, CH_3-CH), 3.62-3.89 (q, 1H, CH_3-CH), 4.83 (s, 2H, -SCH_2), 7.20-7.93 (m, 8H, Ar-H), 8.30 (s, 1H, CH).
IR and ^{1}H NMR Spectra of Compound 4g: IR (KBr): 2975 (C-H), 2850 (C-H), 1690 (C=O), 1625 (C=C), 1390 (C-S), 1090 (C-N), 680 (C-S-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 1.40-1.52 (d, 3H, CH_3-CH), 2.41 (s, 3H, -CH_3), 3.61-3.82 (q, 1H, CH_3-CH), 4.83 (s, 2H, SCH_2), 7.01-7.82 (m, 8H, Ar-H), 8.32 (s, 1H, CH).

IR and ^{1}H NMR Spectra of Compound 4h: IR (KBr): 2982 (C-H), 2855 (C-H), 1965 (C=O), 1620 (C=C), 1395 (C-S), 1095 (C-N), 685 (C-S-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 3.62-3.80 (q, 1H, H-CH), 4.82 (s, 2H, SCH_2), 7.01-7.91 (m, 10H, Ar-H), 8.36 (s, 1H, C-H).

IR and ^{1}H NMR Spectra of Compound 4k: IR (KBr): 2980 (C-H), 2860 (C-H), 1960 (C=O), 1630 (C=C), 1380 (C-S), 1090 (C-N), 695 (C-S-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 3.60-3.76 (q, 1H, H-CH), 3.80 (s, 3H, -OCH_3), 4.83 (s, 2H, SCH_2), 7.01-7.81 (m, 9H, Ar-H), 8.30 (s, 1H, CH).

5–Benzthiazol-2^{1}-yl-thiomethyl)-2-(2^{11}-phenyl-4^{11}-arylidene-5^{11}-imidazoli- non-1-yl)-1, 3, 4-thiadiazole (5 a-g)
A mixture of **(1)** (0.01 M) and 2-phenyl-4-arylidine-5-oxazolone (0.01 M) was refluxed in pyridine (15.0 ml) for 8.0 hrs. The product was poured in water acidified with dilute HCl, filtered and crystallised from 1, 4-dioxane: Water

(3:1). Yield, m. p., molecular formula and elemental analysis with IR and ^{1}H NMR spectra of the representative compounds are recorded in **Table-3.**

IR and ^{1}H NMR Spectra of Compound 5a: IR (KBr): 3055 (C-H), 2980 (C-H), 1755(C=O), 1645 (C=N), 1515 (C=C), 1365 (C-S-C), 1265 (C-O-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 4.68 (s, 2H, -SCH_2) 7.10-8.0 (m, 14H, Ar-H), 8.16 (s, 1H, =CH-Ar).

IR and ^{1}H NMR Spectra of Compound 5c: IR (KBr): 3040 (C-H), 2970 (C-H), 1750 (C=O), 1650 (C=N), 1525 (C=C), 1360 (C-S-C), 1260 (C-O-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 4.66 (s, 2H, -SCH_2), 7.00-7.96 (m, 13H, Ar-H), 8.19 (s, 1H, = CH-Ar).

IR and ^{1}H NMR Spectra of Compound 5e: IR (KBr): 3045 (C-H), 2975 (C-H), 1780 (C=O), 1645 (C=N), 1520 (C=C), 1365 (C-S-C), 1265 (C-O-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 3.82 (s, 3H, -OCH_3), 4.61 (s, 2H, -SCH_2), 7.13-7.99 (m, 13H, Ar-H), 8.20 (s, H, =CH-Ar).

IR and ^{1}H NMR Spectra of Compound 5g: IR (KBr): 3050 (C-H), 2965 (C-H), 1785 (C=O), 1650 (C=N), 1525 (C=C), 1365 (C-S-C), 1260 (C-O-C) cm^{-1}. ^{1}H NMR ($CDCl_3$)δ: 2.41 (s, 3H, -CH_3), 4.63 (s, 2H, -SCH_2) 7.10-8.00 (m, 13H, Ar-H) 8.16 (s, 1H, =CH-Ar).

Antifungal Activity

The antifungal activity of the compounds **(3 a-g), (4 a-n)** and **(5 a-g)** were evaluated against *Phytophthora infestans* and *Collectotricum falcatum* by the usual agar plate technique[13] at 1000, 100 and 10 ppm concentrations[14-18]. **Dithane M-45** a standard commercial fungicide was also tested under similar conditions for comparison. The antifungal screening results of the compounds **(3 a-g), (4 a-n)** and **(5 a-g)** are summarized in **Table-1**. It is appeared from screening results that most of the compounds **(3 a-g)**, **(4 a-n)** and **(5 a-g)**. Significantly inhibited the mycelia growth of both test fungi at 1000 ppm but their activity decreased considerably at lower concentrations (100 and 10 ppm). The compounds **3b, 4b 5b, 3c, 4c, 5c** had similar activity to mancozed at 1000 ppm and showed **53-44%** growth inhibition of both the test fungi at 10 ppm concentration. It was significant alteration in the antifungal activity with the change in the relative position of the substituent on thiadiazole ring for example compound **3b, 4b**, **5b** bearing 2-chloro group were more active than **3c, 4c**, **5c** 4-chloro group. Likewise, introduction of the chloro group was for more effective than that at methyl group.

Table-1 Antifungal activity of 2-azetidinones (3 a-g), 4-thiazolidinones (4 a-n) and 5-imidazolinones (5 a-g)

Compd. No.	Average % inhibition against					
	Phytophthora infestans at			*Collectotricum falcatum* at		
	1000 ppm	100 ppm	10 ppm	1000 ppm	100 ppm	10 ppm
3a.	88	59	42	86	57	40
b.	99	69	53	98	68	52
c.	98	58	48	97	56	44
d.	79	40	32	78	38	30
e.	89	42	39	87	39	34
f.	85	40	32	74	38	31
g.	86	43	34	84	41	31
4a.	82	42	32	85	41	33
b.	99	55	49	98	54	48
c.	98	53	45	97	52	44
d.	95	50	43	94	48	41
e.	93	47	39	93	45	37
f.	82	38	30	81	35	31
g.	86	43	34	84	41	31
h.	82	40	32	80	42	30
i.	99	60	53	98	59	51
j.	97	58	51	96	56	49
k.	77	39	30	76	37	31
l.	79	40	32	78	38	30
m.	72	50	34	72	48	31
n.	81	46	33	80	47	34
5a.	97	58	34	95	54	36
b.	99	65	48	98	63	49
c.	98	58	45	97	54	46
d.	86	57	40	85	54	38
e.	81	46	27	78	45	26
f.	82	55	39	80	52	37
g.	80	51	36	79	48	34
Dithane M-45	**100**	**82**	**68**	**100**	**80**	**66**

RESULTS AND DISCUSSION

The new azetidinone derivatives **(3 a-g),** thiazolidinone derivatives **(4 a-n)** and imidazolidinone dirivatives **(5 a-g)** were prepared from 2-Amino-5-(benzthiazol-2^1-yl-thiomethyl)-1, 3, 4-thiadiazole **(1)**. Compound **(1)** reacts with arylaldehyde and methanol gives 2-arylamino-5-(benthiazol-2^1-yl-thiomethyl)-1, 3, 4-thiadiazole **(2 a-g)** were reacts with monochloroacetyl chloride and triethyl amine in dioxin to give 2-azetidinones **(3 a-g).** Compounds **(2 a-g)** were reacts with mercaptopropionic acid / mercapto acetic acid to give 4-thiazolidinones **(4 a-n).** Compound **(1)** reacts with 2-phenyl-4-arylidene -5-oxazolone refluxed in pyridine to give 5-imidazolinones **(5 a-g).** The structures of the compounds were conformed by their melting points, elemental analysis, IR spectra and position in ^{1}H NMR spectra.

Table-2 Characterization data of 2-arylamino-5-(benzthiazol-2^1-yl-thiomethyl)-1, 3, 4-thiadiazole (2 a-g) and 5-(benzthiazol-2^1-yl-thiomethyl)-2-(4^{11}aryl-3^{11}chloro-2^{11}-azetidinon-1-yl)-1, 3, 4-thiadazole (3 a-g)

Compd. No.	Ar	Molecular Formula	m. p. (^{0}C)	Yield (%)	Found (Calcd) %		
					C	N	S
2a.*	C_6H_5	$C_{17}H_{12}N_4S_3$	165	61	55.43(55.42)	15.21(15.23)	26.08(26.10)
b.	o-ClC_6H_4	$C_{17}H_{11}N_4S_3Cl$	182	63	50.68(50.70)	13.91(13.90)	23.85(23.83)
c.	p-ClC_6H_4	$C_{17}H_{11}N_4S_3Cl$	180	62	50.68(50.69)	13.91(13.89)	23.85(23.86)
d.*	o-$OCH_3C_6H_4$	$C_{18}H_{14}N_4S_3O$	176	60	54.27(54.29)	14.07(14.09)	24.12(24.13)
e.	p-$OCH_3C_6H_4$	$C_{18}H_{14}N_4S_3O$	172	59	54.27(54.26)	14.07(14.06)	24.12(24.11)
f.	o-$CH_3C_6H_4$	$C_{18}H_{14}N_4S_3$	168	61	56.54(56.56)	14.65(14.67)	25.13(25.11)
g.	p-$CH_3C_6H_4$	$G_{18}H_{14}N_4S_3$	170	60	56.54(56.53)	14.65(14.66)	25.13(25.14)
3a.*	C_6H_5	$C_{19}H_{13}N_4S_3OCl$	249	48	51.29(51.31)	12.59(12.57)	21.59(21.60)
b.	o-ClC_6H_4	$C_{19}H_{12}N_4S_3OCl_2$	248	46	47.59(47.61)	11.69(11.71)	20.04(20.06)
c.	p-ClC_6H_4	$C_{19}H_{12}N_4S_3OCl_2$	246	42	47.59(14.58)	11.69(11.73)	20.04(20.07)
d.*	o-$OCH_3C_6H_4$	$C_{20}H_{15}N_4S_3O_2Cl$	242	44	50.57(50.58)	11.80(11.82)	20.23(20.26)
e.	p-$OCH_3C_6H_4$	$C_{20}H_{15}N_4S_3O_2Cl$	240	40	50.57(50.59)	11.80(11.81)	20.23(20.21)
f.	o-$CH_3C_6H_4$	$C_{20}H_{15}N_4S_3OCl$	239	42	52.34(52.36)	12.21(12.19)	20.93(20.95)
g.*	p-$CH_3C_6H_4$	$C_{20}H_{15}N_4S_3OCl$	241	41	52.34(52.33)	12.21(12.23)	20.93(20.92)

Table-3 Characterization data of 5-benzthiazol-2^1-yl-thiomethyl-2-(2^{11}-aryl-5^{11}-alkyl-4^{11}-thiazolidinon-3^{11}-yl)-1, 3, 4-thiadiazoles (4 a-n) and 5-benzthiazol-2^1-yl-thiomethyl-2-(2^{11}-phenyl-4^{11}-arylidene-5^{11}-imidazolinon-1^1-yl)-1, 3, 4-thiadiazole (5 a-g)

Compd. No.	Ar	R	Molecular Formula	m. p. (^{0}C)	Yield (%)	Found (Calcd) %		
						C	N	S
4a.	C_6H_5	CH_3	$C_{20}H_{16}N_4S_4O$	230	61	52.63(52.64)	12.28(12.31)	28.07 (28.10)
b.	o-ClC_6H_4	CH_3	$C_{20}H_{15}N_4S_4OCl$	233	63	48.92(48.90)	11.41(11.43)	26.09 (26.07)
c.*	p-ClC_6H_4	CH_3	$C_{20}H_{15}N_4S_4OCl$	228	62	48.92(48.95)	11.41(11.40)	26.09 (26.12)
d.	o-$OCH_3C_6H_4$	CH_3	$C_{21}H_{18}N_4S_4O_2$	229	61	51.85(51.87)	11.52(11.50)	26.33(26.37)
e.	p-$OCH_3C_6H_4$	CH_3	$C_{21}H_{18}N_4S_4O_2$	230	60	51.85(51.82)	11.52(11.49)	26.33 (26.31)
f.	o-$CH_3C_6H_4$	CH_3	$C_{21}H_{18}N_4S_4O$	232	62	53.61(53.60)	11.91(11.93)	27.23(27.21)
g.*	p-$CH_3C_6H_4$	CH_3	$C_{21}H_{18}N_4S_4O$	227	60	53.61(53.63)	11.91(11.89)	27.23 (27.26)
h.*	C_6H_5	H	$C_{19}H_{14}N_4S_4O$	198	53	51.58(51.56)	12.66(12.68)	28.95 (28.96)
i.	o-ClC_6H_4	H	$C_{19}H_{13}N_4S_4OCl$	188	56	47.84(47.86)	11.75(11.76)	26.86 (26.82)
j.	p-ClC_6H_4	H	$C_{19}H_{13}N_4S_4OCl$	176	52	47.84(47.83)	11.75(11.73)	26.86 (26.84)
k.*	o-$OCH_3C_6H_4$	H	$C_{20}H_{16}N_4S_4O_2$	178	53	50.84(50.86)	11.86(11.85)	27.11 (27.13)
l.	p-$OCH_3C_6H_4$	H	$C_{20}H_{16}N_4S_4O_2$	182	51	50.84(50.83)	11.86(11.82)	27.11(27.10)
m.	o-$CH_3C_6H_4$	H	$C_{20}H_{16}N_4S_4O$	191	54	52.63(52.65)	12.28(12.26)	28.07 (28.10)
n.	p-$CH_3C_6H_4$	H	$C_{20}H_{16}N_4S_4O$	194	50	52.63(52.60)	12.28 (12.30)	28.07(28.05)
5a.*	C_6H_5	--	$C_{26}H_{17}N_6S_2O$	160	42	63.28(63.30)	17.03(17.06)	12.98(13.00)
b.	o-ClC_6H_4	--	$C_{26}H_{16}N_6S_2OCl$	162	46	59.14(59.12)	15.92(15.91)	12.13(12.11)
c.*	p-ClC_6H_4	--	$C_{26}H_{16}N_6S_2OCl$	158	44	59.14(59.16)	15.92(15.93)	12.13(12.16)
d.	o-$OCH_3C_6H_4$	--	$C_{27}H_{19}N_6S_2O_2$	161	45	61.95(61.98)	16.06(16.10)	12.23(12.25)
e.*	p-$OCH_3C_6H_4$	--	$C_{27}H_{19}N_6S_2O_2$	159	42	61.95(61.99)	16.06(16.09)	12.23(12.02)
f.	o-$CH_3C_6H_4$	--	$C_{27}H_{19}N_6S_2O$	162	43	63.90(63.93)	16.56(16.59)	12.62(12.60)
g.*	p-$CH_3C_6H_4$	--	$C_{27}H_{19}N_6S_2O$	160	41	63.90(63.88)	16.56(16.55)	12.62(12.63)

CONCLUSION

It is appeared from screening results the most of the compounds **(3 a-g), (4 a-n)** and **(5 a-g)** significantly inhibited the mycelia growth of both test fungi at 1000 ppm but their activity decreased considerably at lower concentration (100 and 10 ppm). The compounds **3b, 4b 5b, 3c, 4c, 5c** had similar activity to mancozed at 1000 ppm and showed **53-44%** growth inhibition of both test fungi at 10 ppm concentration. Significant alteration of the fungicidal activity was observed with the change in the relative position of the substituent on azetidinone, thiazolidinone and imidazolidinone with benzothiazole-thiomethyl thiadiazole ring e. g. compounds **3b, 4b**, **5b** bearing 2-chloro group

were more active than **3c, 4c**, **5c** 4-chloro group. Likewise, introduction of the chloro group was for more effective than that at methyl group.

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REFERENCES

[1] T. P. Singh, P. K. Sharma, S. C. Mondalc and N. Kumar. *J. Chem. Pharm. Res.,* **2011**, 3(5): 609-615.
[2] M. Seth and P. Sah. *J. Chem. Pharm. Res.,* **2012**, 4(1): 146-153.
[3} R. Dua, S. K. Sonwane, S. K. Shrivastava and S. D. Shrivastava. *J. Chem. Pharm. Res.,* **2010**, 2(1): 415-423.
[4] A. Padmaja, C. Rajasekhar, A. Muralikrishna and V. Padmavathi. *J. Chem. Pharm. Res.,* **2012**, 4(1): 294-302.
[5] M. Maru and M. K. Shah. *J. Chem. Pharm. Res.,* **2012**, 4(3): 1638-1643.
[6] N. Houngbodji, K. Waisser, Z. Odlerova, W. Thiel and R. Mayer. *Pharmazie,* **1990,** 45: 141; *Chem. Abstr*., 1990, 113, 196v.
[7] B. Radha Rani, U. T. Bhalerao and M. F. Raheman. *Indian J. Chem.,* **1990,** 29B: 995.
[8] B. Dash, M. Patra and S. Praharaj. *Indian J. Chem.,* **1980,** 19B: 894.
[9] I. Isikdag, U. Lcueu, T. S. Doga, *Bilimlexi Derg*. **1990,** 14(1), 158; *Chem. Abstr.*, 1988, 94**,** 184199c.
[10] G. R. Chatwal, *Synthetic Drugs*. 2nd Edition, **1988,** 235.
[11] A. I. Vogel, *"Textbook of Practical Organic Chemistry***.** *ELBS 5th Edition,"* **1994**, p. 1156.
[12] V. Ballavita and L. Vantaggi. *Ann. Chem. (Rome),* **1951**, 41, 194; *Chem. Abstr.*, 1952, 46**,** 497_b.
[13] J. G. Horsfall. *Bot. Rev.* **1945,** 11**,** 357.
[14] V. J. Ram and H. N. Pandey. *Agric. Biol. Chem.*, **1993,** 37, 2191.
[15] Y. Yasuda and U. Uchiyama. *Japan Kokai*, **1974,** 7, 020, 355; *Chem. Abstr.*, 1974, 81, 73399.
[16] J. C. Debaurage, D. Pillon and S. Trinh. *Ger. Offen*, **1974,** 3, 361, 613; *Chem. Abstr.*, 1974, 81, 91537.
[17] Y. Okada. *Japanese Pat.*, **1970,** 7, 024, 982; *Chem. Abstr.*, 1970, 73, 98953.
[18] F. Suzuki, K. I. Kawa, F. Matahasi and S. Hayashi. *Japanese Pat.*, **1976,** 007, 7602; *Chem. Abstr.*, 1977, 86, 55451.