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Synthesis, characterization and anticandidal activity of dioxomolybdenum(VI) complexes of the type $[MoO_2\{ON{=}C(CH_3)Ar\}_2]$ and $[MoO_2\{OC(R)CHC(R')=NC_6H_5\}_2]$

Purnima Nag *, Deepankar Sharma

Department of Chemistry, Jaipur National University, Jaipur, 302017, India

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ABSTRACT

Interaction of $[MoO_2(acac)_2]$ with internally functionalized oximes like $HON{=}C(CH_3)Ar$ (Ar = C_4H_3S, C_4H_3O or C_5H_4N) and Schiff's Bases derived from β – diketones like $HOC(R)CHC(R')=NC_6H_5$ (R = R' = CH_3 or C_6H_5; R = CH_3 and R' = C_6H_5) led to the formation of yellow dioxomolybdenum(VI) complexes of the type $[MoO_2\{ON{=}C(CH_3)Ar\}_2]$ and $[MoO_2\{OC(R)CHC(R')=NC_6H_5\}_2]$. Oximes were synthesized by green methodology. The newly synthesized complexes were characterized on basis of elemental analysis and various spectral findings.

Anticandidal activity of $[MoO_2\{ON{=}C(CH_3)C_6H_4N\}_2]$ clearly reveals that the complex is biologically active against fungal diseases.

1. Introduction

Molybdenum has been an important metal due to its capability of forming complexes with variety of ligands [1, 2, 3, 4], it is an essential constituent of recognized enzymes that catalyzes reduction of molecular nitrogen and nitrates in plants and oxidation (hydroxylation) of Xanthine and other Purines as well as aldehydes in animals [5]. Oxo- and dioxo-molybdenum complexes have been generously studied as catalysts for variety of organic transformations, commonly for sulfoxidation of sulfides [5], oxygen atom transfer (OAT) reactions [6, 7, 8, 9, 10, 11, 12]; antioxidant activities [13], and also as neutral esterification agents [14].

The variety of transition metal complexes with wide choice of oximes and schiff's bases ligand system and coordination environment have instigated us to undertake research in this area [15]. Complexes with Schiff base ligand systems have showed significant applications in many organic transformations as homogeneous and heterogeneous catalysts [16] such as in reduction of ketones to alcohols [17] and alkylation of allylic substrates [18, 19, 20]. Oxime metal chelates exhibit higher biological activity than corresponding free ligands [21]. Varied metallic complexes of oximes exhibited cytotoxicity in murine and human tissue cultured cell lines [22].

In continuation to our previous work [14, 23, 24, 25, 26] and to further study the chemistry of oxomolybdenum complexes incorporating oxygen, nitrogen and sulphur donor atoms; the synthesis of dioxomolybdenum(VI) complexes with internally functionalized oximes and Schiff's bases derived from β-diketones is reported in present work.

2. Experimental

2.1. Materials and methods

2- acetyl thiophene, 2-acetyl furan, 2- acetyl pyridine, pentane 2,4 dione, 1-phenyl butane-1,3 dione, 1,3 diphenyl, propane-1,3 dione, acetylacetone and aniline (from Merck) were used as such. Hydroxylamine hydrochloride, sodium hydroxide and sodium acetate (from E. Merck) were used after drying at reduced pressure for 4–5 hours to ensure the complete removal of absorbed moisture. Precursor $[MoO_2(acac)_2]$ was synthesized according to the literature method [27]. Oximes were synthesized by novel green methodology without using any organic solvent. Schiff basese of β-diketones were synthesized by literature method [28]. Molybdenum was estimated gravimetrically as oxinate. C and H were analyzed on a Perkin-Elmer C, H, N and S II series 2400 analyzer. Sulphur and nitrogen were estimated by standard methods. FT-IR spectra were recorded on a Perkin-Elmer spectrophotometer in the 4000-400 cm^{-1} range using KBr pellets. ^{1}H-NMR spectra were recorded in $CDC1_3$ and d_6-DMSO using TMS as an internal reference on a JEOL

* Corresponding author.
E-mail address: purnima_nag007@yahoo.com (P. Nag).

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FX90Q spectrometer. UV spectra were measured using a copy- 50 Bio (Varian) UV-visible spectrophotometer. FAB mass spectra were recorded on a JEOL SX 102/DA-6000 mass spectrometer/Data system using Ar/Xe (6kv, 10mA) as the FAB gas, *m*-nitrobenzyl alcohol was used as the matrix.

2.2. Synthesis of oximes by green method

A solution of 2- acetyl thiophene (1.0g, 7.926 mmol) and hydroxylamine hydrochloride (0.55g, 7.926 mmol) in 10–12 ml water was stirred at 40–50 °C for half an hour. To this solution, sodium hydroxide pellets (0.32g, 7.926 mmol) were added portion wise and contents were stirred for another 2 hours at room temperature. The precipitate was collected by filtration, washed with water and dried in vacuum to obtain white solid product. A similar procedure was used to prepare compounds $HON{=}C(CH_3)C_4H_3O$ and $HON{=}C(CH_3)C_5H_4N$.

2.3. Synthesis of $[MoO_2\{ON{=}C(CH_3)C_4H_3S\}_2]$

A solution of $[MoO_2(acac)_2]$ (2.41g, 7.40 mmol) and $HON{=}C(CH_3)C_4H_3S$ (2.09g, 14.81 mmol) in ethanol was stirred at room temperature for 2 hours. After stripping off the solvent from yellow colored solution under reduced pressure the product was isolated as yellow solid.

A similar procedure was used to prepare compounds $[MoO_2\{ON{=}C(CH_3)C_4H_3O\}_2]$, $[MoO_2\{OC(CH_3)CHC(CH_3){=}NC_6H_5\}_2]$, $[MoO_2\{OC(CH_3)CHC(C_6H_5)N{=}C_6H_5\}_2]$ and $[MoO_2\{OC(C_6H_5)CHC(C_6H_5)N{=}C_6H_5\}_2]$. Physical data for these newly synthesized complexes are provided as supplementary material (Table S2).

2.4. Synthesis of $[MoO_2\{ON{=}C(CH_3)C_5H_4N\}_2]$

To the ethanolic solution of $[MoO_2(acac)_2]$ (2.08g, 6.38 mmol), ethanolic solution of $HON{=}C(CH_3)C_5H_4N$ (1.74g, 12.78 mmol) was added. Yellow precipitate was immediately obtained. The mixture was stirred for 2 hours. The precipitate was collected by filtration, washed with ethanol and dried in vacuum.

The compound $[MoO_2\{ON{=}C(C_5H_4N)\}_2]$ may also be synthesized by the following procedure:

To an aqueous solution of sodium molybdate (2.41g, 9.26 mmol) an ethanolic solution of 2-acetyl pyridyl oxime (2.52g, 18.53 mmol) was added. 5% solution of sulfuric acid was added to it. This mixture was stirred for 2 hours. Yellow precipitate, so obtained (at pH 5.2) was collected through filtration, washed with distilled water and dried over P_4O_{10} in vacuum.

The analytical results of both types of complexes are summarized in Table 1.

3. Results and discussion

The interaction of $[MoO_2(acac)_2]$ with internally functionalized oximes like $HON{=}C(CH_3)Ar$ ($Ar{=}C_4H_3S$, C_4H_3O or C_5H_4N) and Schiff bases derived from β-diketones like $HOC(R)CHC(R'){=}NC_6H_5$ ($R = R' = CH_3$ or C_6H_5, $R = CH_3$ and $R' = C_6H_5$) in 1:2 molar ratio in CH_3OH has led to the formation of yellow dioxomolybdenum(VI) complexes of the types, $[MoO_2\{ON{=}C(CH_3)Ar\}_2]$ and $[MoO_2\{OC(R)CHC(R'){=}NC_6H_5\}_2]$.

$$\left[MoO_2(acac)_2\right] + 2HON{=}C(CH_3)Ar \xrightarrow[-2acacH]{EtOH,\ stirring} \left[MoO_2\{ON{=}C(CH_3)Ar\}_2\right]$$

$$\left[MoO_2(acac)_2\right] + 2HOC(R)CHC(R'){=}NC_6H_5 \xrightarrow[-2acacH]{EtOH,\ stirring} \left[MoO_2\{OC(R)CHC(R'){=}NC_6H_5\}_2\right]$$

All these products are yellow colored solids and are soluble in polar solvents like CH_3OH, CH_3CN, THF etc. except $[MoO_2\{ON{=}C(CH_3)C_5H_4N\}_2]$ which remain sparingly soluble even in coordinating solvents like DMF and DMSO. Elemental analysis and m.p. of all the complexes have been summarized in Table 1.

3.1. IR Spectra

Some important IR spectral bands of complexes are summarized in Table 2. IR spectra of a representative complex $[MoO_2\{ON{=}C(CH_3)C_5H_4N\}_2]$ and its parent ligand are provided as supplementary material (Figs. S1 and S2).

The absence of a signal in the spectra of the complexes, $[MoO_2\{ON{=}C(CH_3)Ar\}_2]$ and $[MoO_2\{OC(R)CHC(R'){=}NC_6H_5\}_2]$ due to

Table 2
Some characteristic IR spectral data of $[MoO_2\{ON{=}C(CH_3)Ar\}_2]$ and $[MoO_2\{OC(R)CHC(R'){=}NC_6H_5\}_2]$.

S. No.	Complex	υ (C=N) in cm^{-1}	υ (C = X; aromatic ring) or υ (C=C; β-diketone) in cm^{-1}	υ (Mo=O) in cm^{-1}
1	$[MoO_2\{ON{=}C(CH_3)C_4H_3S\}_2]$	1515 (m)	1390 (w)	900 (s) 920 (s)
2	$[MoO_2\{ON{=}C(CH_3)C_4H_3O\}_2]$	1500 (m)	1410 (w)	905 (s) 920 (s)
3	$[MoO_2\{ON{=}C(CH_3)C_5H_4N\}_2]$	1490 (m)	1450 (w)	890 (s) 910 (s)
4	$[MoO_2\{OC(CH_3)CHC(CH_3){=}NC_6H_5\}_2]$	1620 (s)	1400 (m)	915 (s) 925 (s)
5	$[MoO_2\{OC(CH_3)CHC(C_6H_5){=}NC_6H_5\}_2]$	1610 (s)	1380 (m)	900 (s) 925 (s)
6	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5){=}NC_6H_5\}_2]$	1605 (s)	1370 (m)	890 (s) 910 (s)

Table 1
Elemental Analysis and m.p. of $[MoO_2\{ON{=}C(CH_3)Ar\}_2]$ and $[MoO_2\{OC(R)CHC(R'){=}NC_6H_5\}_2]$.

S. No.	Complex	Elemental Analysis (%) Found (Calcd.)					M.P. (°C)[d]
		C	H	N	S	Mo	
1	$[MoO_2\{ON{=}C(CH_3)C_4H_3S\}_2]$	34.52 (34.91)	2.80 (2.88)	6.63 (6.82)	15.48 (15.73)	23.33 (23.52)	205
2	$[MoO_2\{ON{=}C(CH_3)C_4H_3O\}_2]$	37.98 (38.27)	3.02 (3.19)	7.18 (7.43)	-	25.91 (25.48)	200
3	$[MoO_2\{ON{=}C(CH_3)C_5H_4N\}_2]$	42.84 (42.23)	3.61 (3.49)	14.13 (14.04)	-	24.05 (24.09)	210
4	$[MoO_2\{OC(CH_3)CHC(CH_3){=}NC_6H_5\}_2]$	55.03 (55.48)	4.83 (4.91)	5.82 (5.88)	-	20.31 (20.24)	173
5	$[MoO_2\{OC(CH_3)CHC(C_6H_5){=}NC_6H_5\}_2]$	63.74 (64.04)	4.63 (4.68)	2.15 (2.28)	-	16.14 (15.98)	175
6	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5){=}NC_6H_5\}_2]$	69.14 (69.58)	4.17 (4.35)	3.47 (3.88)	-	13.01 (13.18)	180

υ (OH) in the 3600-3200 cm^{-1} region suggests that ligands are bonded to molybdenum through the oxygen atom *via* deprotonation [28] (for IR details of ligands, refer Table S1 in supplementary data). This is further supported by two strong bands in the region 890-935 cm^{-1} assigned to *cis* (Mo=O) symmetric and antisymmetric stretching vibrations [27, 29].

A weak band is observed in the free oximes in the range 1690–1640 cm^{-1}, characteristic of the azomethine (>C=N) group has shifted to lower frequencies (1515-1490 cm^{-1}) in the spectra of the complexes of the type $[MoO_2\{ON=C(CH_3)Ar\}_2]$. Additionally, υ (C = X) (X = S, O or N) of aromatic ring in complexes were observed in the range 1450–1390 cm^{-1} in IR spectrum. These values are lower than that observed for related free oximes in range 1490–1405 cm^{-1} [30,31]; suggesting the bidentate behavior of the ligands.

The bands of υ (C=N) in the spectra of the complexes $[MoO_2\{OC(R)CHC(R')=NC_6H_5\}_2]$ were observed in the region 1620-1605 cm^{-1} indicating the formation of a coordinate bond through nitrogen to molybdenum atom [32]. These values are lower than that of free schiff bases in region 1630-1620 cm^{-1}; characteristic of the azomethine (>C=N) group [33]. Bidentate behavior of Schiff bases is further supported by bands of C=C (of β-diketone) observed in the region 1400-1370 cm^{-1} for the respective complexes; which is lower in comparison to that of free Schiff bases (1460-1405 cm^{-1}).

3.2. Electronic Absorption Spectra

The important electron absorption bands in the spectra of all these derivatives are complied in Table 3.

Dioxomolybdenum(VI) complexes of oxime derivatives $[MoO_2\{ON=C(CH_3)Ar\}_2]$ exhibit bands in 273–300 nm ranges which may be attributed to intraligand transitions [34]. Similarly, Schiff base derivatives, $[MoO_2\{OC(R)CHC(R')=NC_6H_5\}_2]$ show such transitions at 307–317 nm [35].

Bands at 320–333 nm are characteristics of ligand to molybdenum(VI) charge transfer transitions in both types of complexes [27]. The absence of bands due to d-d transition in the range 650–420 nm supports the presence of molybdenum in +6 oxidation state.

3.3. ^1H NMR Spectra

The proton chemical shifts of these derivatives are summarized in Table 4.

The OH signals present in the spectra of the free oximes and Schiff bases are found to be absent in the spectra of the above complexes showing deprotonation of the ligands, resulting in the formation of the desired products [28]. A comparison of peak positions in these complexes with those of their corresponding positions in the spectra of the free ligands [28, 30, 31, 32] reveals their high field shifting (*ca* 0.2–0.4 δ ppm), indicating bonding of the ligand moieties to the molybdenum atom.

Table 3
Some Relevant Electronic Absorption Spectral Data [λ_{max} in nm] for $[MoO_2\{ON=C(CH_3)Ar\}_2]$ and $[MoO_2\{OC(R)CHC(R')=NC_6H_5\}_2]$.

S. No.	Complex	n→π*	π →π*	$O_t \rightarrow Mo^{VI}$
1	$[MoO_2\{ON=C(CH_3)C_4H_3S\}_2]$	365 (1.59)	210 (0.39)	318 (1.67)
2	$[MoO_2\{ON=C(CH_3)C_4H_3O\}_2]$	353 (1.66)	218 (0.77)	325 (1.56)
3	$[MoO_2\{ON=C(CH_3)C_5H_4N\}_2]$	375 (1.57)	213 (0.91)	315 (1.13)
4	$[MoO_2\{OC(CH_3)CHC(CH_3)=NC_6H_5\}_2]$	369 (1.37)	217 (-0.60)	319 (1.01)
5	$[MoO_2\{OC(CH_3)CHC(C_6H_5)=NC_6H_5\}_2]$	370 (1.33)	215 (-0.69)	315 (0.63)
6	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5)=NC_6H_5\}_2]$	371 (1.32)	216 (-0.68)	309 (0.63)

Table 4
^1H-NMR Spectral Data (δ p.p.m.) of $(MoO_2\{ON=C(CH_3)Ar\}_2]$ and $[MoO_2\{OC(R)CHC(R')=NC_6H_5\}_2]$.

S. No.	Complex	^1H Chemical Shift
1	$[MoO_2\{ON=C(CH_3)C_4H_3S\}_2]$	2.24(s,6H CH_3); 7.02(dd, 2H,H-4)C; 7.11 (d, 2H, H-3); 7.24 (d, 2H, H-5)
2	$[MoO_2\{ON=C(CH_3)C_4H_3O\}_2]$	2.15(s,6H CH_3); 6.40(dd, 2H,H-4)C; 6.43 (d, 2H, H-3); 7.33 (d, 2H, H-5)
3	$[MoO_2\{ON=C(CH_3)C_5H_4N\}_2]$	2.19(s,6H CH_3); 7.15(dd, 2H,H-4)C; 7.60 (dd, 2H, H-5); 7.85 (d, 2H, H-3); 8.43(d,2H,H-6)
4	$[MoO_2\{OC(CH_3)CHC(CH_3)=NC_6H_5\}_2]$	2.17(s,6H, CH_3CN); 2.21(s,6H, CH_3CO), 5.87 (s,2H, CH); 6.51–7.45 (m, 10H, C_6H_5)
5	$[MoO_2\{OC(CH_3)CHC(C_6H_5)=NC_6H_5\}_2]$	2.34 (s,6H, CH_3 CO); 5.91(s,2H, CH); 7.01–7.57 (m.20H, C_6H_5)
6	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5)=NC_6H_5\}_2]$	3.81 (s, 2H, CH); 7.01–7.78 (m, 30H, C_6H_5)

Table 5
^{13}C $\{^1H\}$ NMR Spectral Data (δ ppm) of $(MoO_2\{ON=C(CH_3)Ar\}_2]$ and $[MoO_2\{OC(R)CHC(R')=NC_6H5\}_2]$.

S. No.	Complex	^{13}C $\{^1H\}$ Chemical Shift
1	$[MoO_2\{ON=C(CH_3)C_4H_3S\}_2]$	11.9 (CH_3); 125.3(C-4); 125.9(C-3); 127.5(C-5); 143.4(C-2); 152.5(C–N)
2	$[MoO_2\{ON=C(CH_3)C_4H_3O\}_2]$	10.8(CH3); 104.9(C-4), 110.3(C-3); 142.0 (C-5); 148.4(C-2); 153.3 (C–N)
3	$[MoO_2\{OC(CH_3)CHC(CH_3)=NC_6H_5\}_2]$	20.4 (CH_3CN), 25.1(CH_3CO), 48.4 (C_6H_5), 159.4 (C=N), 196.5(CO)
4	$[MoO_2\{OC(CH_3)CHC(C_6H_5)=NC_6H_5\}_2]$	19.3 (CH_3CN), 97.3(CH), 123–128.8 (C_6H_5), 120.4–127.9 (C=N), 194.6(CO)
5	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5)=NC_6H_5\}_2]$	92.6(CH), 112.7–128.2 (C_6H_5), 163.8 (C=N), 185.0 194.6(CO)

Shifting of aromatic protons of the oxime moiety as well as of phenyl protons of the Schiff base to lower ppm value indicate bidentate behaviour of these ligands towards molybdenum(VI) moiety.

3.4. ^{13}C $\{^1H\}$ NMR Spectra

The ^{13}C $\{^1H\}$ NMR spectra of these complexes exhibit characteristic peaks for ligand carbon atoms. The data are summarized in Table 5. Down field shifting of C=N, C-2 and C-5 ary1 carbon signals of the oxime group as well as C=N and pheny1 carbon signals of the Schiff base in ^{13}C $\{^1H\}$ NMR Spectra of these complexes as compared to the free ligands [30, 31] suggest bidentate behaviour of the ligands.

3.5. FAB Mass Spectra

Some of the most important mass spectral ion peaks of a typical oxime as well as a Schiff base derivative of dioxomolybdenum(VI), $[MoO_2\{ON=C(CH_3)C_5H_4N\}_2]$ and $[MoO_2\{OC(C_6H_5)CHC(C_6H_5)=NC_6H_5\}_2]$, with their tentative assignments are compiled in Tables 6 and 7. FAB mass spectrum of the $[MoO_2\{ON=C(CH_3)C_5H_4N\}_2]$ exhibits the highest ion peak at m/z = 447, suggesting monomeric behavior of the complex with association of (CH_3NOH^+) moiety.

Similarly the complex $[MoO_2\{OC(C_6H_5)CHC(C_6H_5)=NC_6H_5\}_2]$ shows the highest ion peak at m/z = 899, indicating the presence of monomeric unit of the complex associated with ($C_6H_5COC_5H_8$) moiety.

3.6. Anticandidal Activity

The *in vitro* evaluation of anticandidal activity for $[MoO_2\{ON=C(CH_3)C_5H_4N\}_2]$ was carried out against *Candida albicans* in *Dr. B. Lal Clinical Laboratory Pvt. Ltd. - Centre for Innovation, Research and Development (CIRD), Jaipur* using Kirby-Bauer well diffusion method [36]. Compound was dissolved in DMSO at concentrations C1 = 10

Table 6
FAB mass spectral data of $[MoO_2\{ON{=}C(CH_3)C_5H_6N\}_2]$.

m/e	Assignment
447	$[MoO_2\{ONC(CH_3)C_5H_4N\}_2CH_3NOH]^+$
440	$[MoO_2\{ONC(CH_3)C_5H_4N\}_2]$
371	$[MoO_2\{ONC(CH_3)C_5H_4N)(COC_5H_4N)]$
339	$[MoO_2(CH{\equiv}CC_5H_4N)\ (COC_5H_4N)]$
289	$[MoO_2(C_3H_3N)\ (COC_5H_4N)]$
261	$[MoO_2(C_3H_3N)\ (C_5H_4N)]$
232	$[MoO_2(C_6H_4CN)]^{\cdot}$
206	$[MoO_2(C_6H_4)]^{\cdot}$
192	$[MoO_2(C_5H_2)]$
149	$[Mo(OH)_3]$
137	$[Mo(C_3H_3)]$

Table 7
FAB mass spectral data of $[MoO_2\{OC(C_6H_5)CHC(C_6H_5){=}NC_6H_5\}_2]$.

m/e	Assignment
899	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5){=}NC_6H_5\}_2]\ C_6H_5COC_5H_8$
752	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5)NC_6H_5\}_2]\ C_2H_2$
712	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5)NC_5H_3\}\{OC(C_6H_5)CHC(C_6H_5)NC_6H_5\}]$
688	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5)NC_3H_3\}\{OC(C_6H_5)CHC(C_6H_5)NC_6H_5\}]$
609	$[MoO_2\{OC(C_6H_5)CHC(C_4H_3)NC_3H_3\}\{OC(C_6H_5)CHC(C_6H_5)NC_6H_5\}]$
560	$[MoO_2\{OC(C_6H_5)CHC(C_6H_5)NC_6H_5\}.C_6H_5CHO.C_2H_2]$
473	$[MoO_2\{OCH_2CH(C_6H_5)NHC_6H_5\}.C_6H_5CHO.C_2H_2]$
396	$[MoO_2\{OCH_2CH(C_6H_5)NHC_6H_5\}.C_3H_3O]$
351	$[MoO_2\{OCH_2CH(C_6H_5)NHC_6H_5\}.C_3H_3O]$
225	$[MoO_2.C_6H_5.C_2H_6]$
154	$[MoO\{C_3H_4\}]$
136	$[Mo\{C_3H_2\}]$

Table 8
Anticadidal activity of $[MoO_2\{ON{=}C(CH_3)C_5H_4N\}_2]$.

Compound	Zone of Inhibition (mm)
	Candida albicans
NC – DMSO	NZI
$[MoO_2\{ON{=}C(CH_3)C_5H_4N\}_2]$ at C1	NZI
$[MoO_2\{ON{=}C(CH_3)C_5H_4N\}_2]$ at C2	14
PC - Amphotericin B (50μg)	2

NZI - No zone of inhibition.

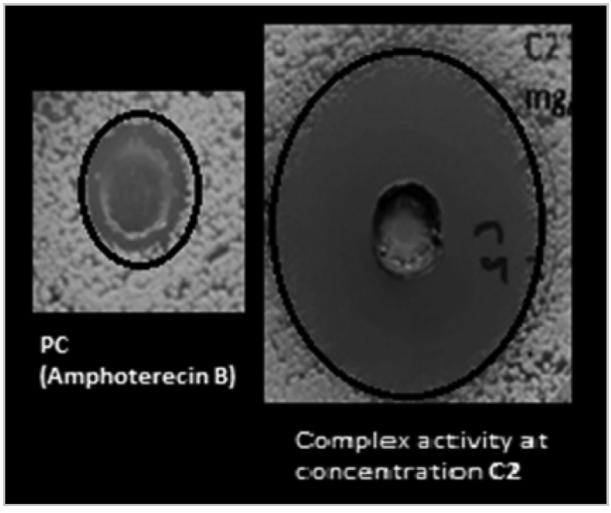

Fig. 1. Anticandidal activity of $[MoO_2\{ON{=}C(CH_3)C_5H_4N\}_2]$.

$mgmL^{-1}$ and C2 = 100 $mgmL^{-1}$ concentrations; Amphotericin B was used as PC- positive control at 50 μg/ml concentration and DMSO was used as NC- negative control. Results of anticandidal activity are listed in Table 8 (also see Fig. 1).

4. Conclusion

In absence of crystal structure which may be due to the amorphous nature of the synthesized novel molecules, we cannot put forward the exact structures of the respective compounds; but in view of the above elemental and spectral studies, we may propose that all the complexes synthesized can be represented as $[MoO_2L_2]$ (where L = corresponding ligand; oxime/schiff base). Anticandidal activity has been carried out on $[MoO_2\{ON{=}C(CH_3)C_6H_4N\}_2]$ which clearly reveals that the complex is biologically active.

Declarations

Author contribution statement

Deepankar Sharma: Performed the experiments; Wrote the paper.
Purnima Nag: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

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Additional information

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