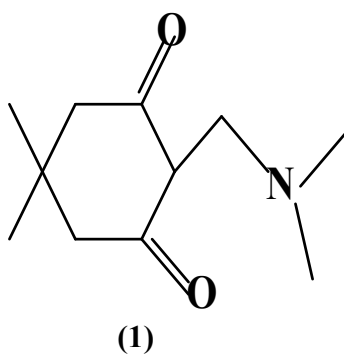


3.Results and discussion

A targeted series of phenolic and ketonic Mannich bases were synthesized via a general strategy involving the condensation of an active hydrogen compound with different secondary amines in presence of formalin. Also a series Schiff's bases were synthesized by the condensation of carbonyl group in synthesized Mannich bases with different secondary amines in presence of sulphuric acid. The targeted molecules were then evaluated for their antimicrobial potential.

3.1-Synthesis of the Mannich base: 2-dimethylaminomethyl-5,5-dimethylcyclohexane-1,3-dione (1)

The Mannich base (1) was synthesized by adding formalin dropwise to a mixture of dimedone and dimethylamine in absolute ethanol at room temperature .



IR spectrum (Fig.1) showed $\nu(\text{KBr})$: 1247 (C-N) , 1610 (C=O) and 2931 (C-H, aliph.) .

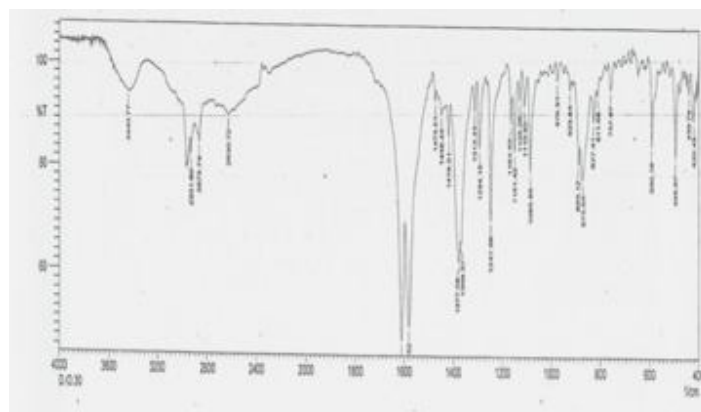


Fig. 1: IR spectrum of Mannich base 1

The Mass spectrum (Fig.2) gave m/z 197 for $M^+ + 1$.

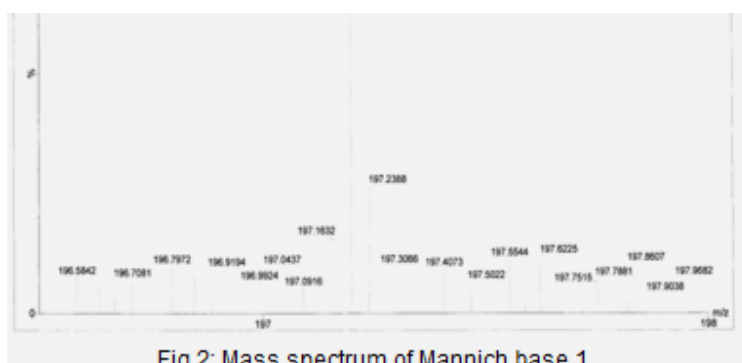


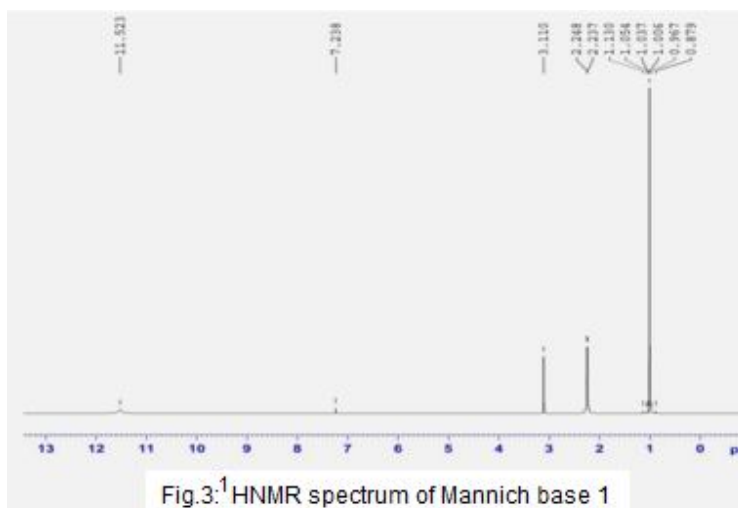
Fig.2: Mass spectrum of Mannich base 1

The ^1H NMR spectrum (Fig.3) revealed the following signals:

δ 0.96	singlet	6H
δ 2.23-2.24	multiplet	10H
δ 3.11	singlet	3H

The signal at δ 0.96 (s,6H) was assigned for the two methyl groups of dimedone moiety, while the multiplet at δ 2.23-2.24

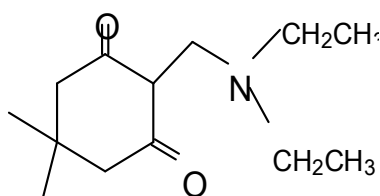
(10H) corresponds to the methylene group of dimedone moiety and two methyl groups of dimethylamine moiety. The resonance at δ 3.11 (s,3H) was assigned for a methine proton and methylene of the Mannich base side chain.



On the basis of the above spectral data structure 1 above was assigned for this Mannich base.

3.2- Synthesis of the Mannich base : 2-diethylaminomethyl-5,5-dimethylcyclohexane-1,3-dione(2)

The Mannich base (2) was synthesized by adding formalin dropwise to a mixture of dimedone and diethylamine in absolute ethanol at room temperature .



(2)

IR spectrum (Fig.4) showed $\nu(\text{KBr})$: 1247 (C-N) , 1610 (C=O) and 2966 (C-H, aliph.) .

The Mass spectrum (Fig.5) gave m/z 225.22 for $M^+ + 1$.

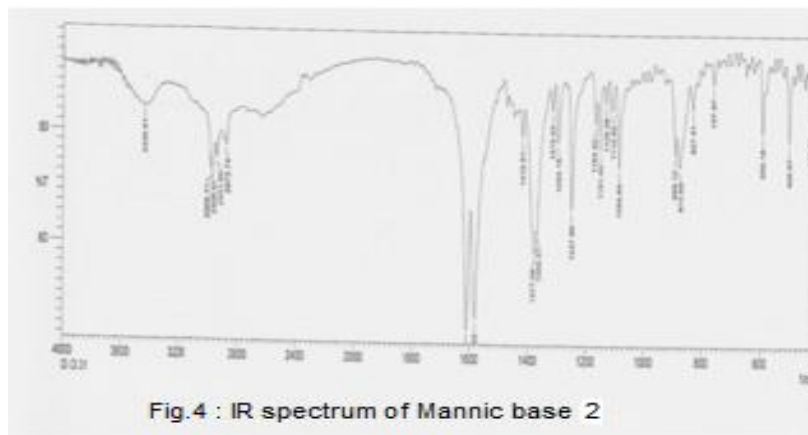


Fig.4 : IR spectrum of Mannich base 2

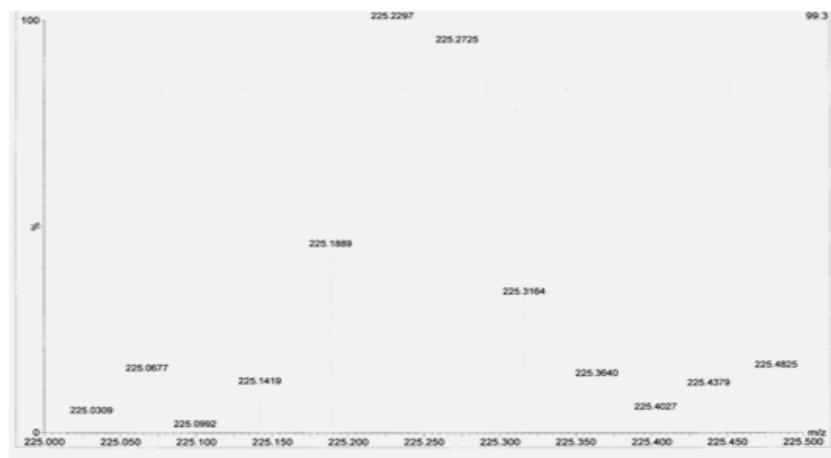
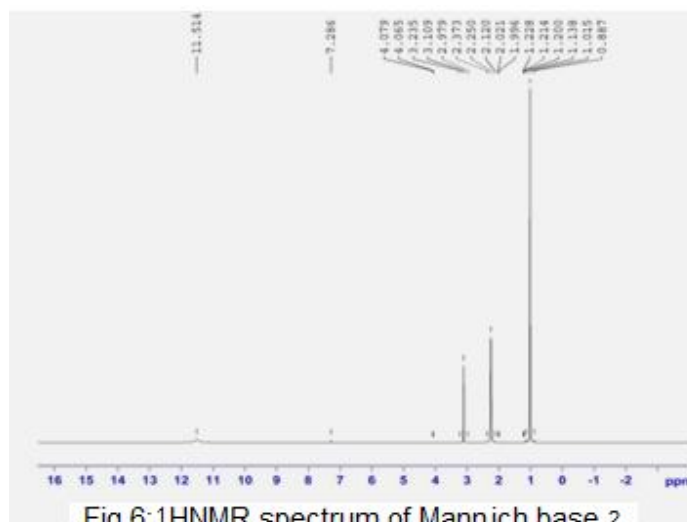


Fig.5: Mass spectrum of Mannich base 2

The ^1H NMR spectrum (Fig.6) revealed the signals:

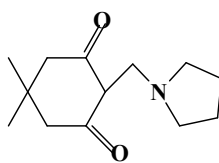
δ 0.88-1.2	multiplet	12H
δ 2.25	triplet	8H
δ 3.1	triplet	3H

The signal at δ 0.88- 1.2 (m,12H) was assigned for the four methyl groups ,while the triplet at δ 2.25 (8H) corresponds to the 4 methylene groups of dimedone and diethylamine moieties .The signal at δ 3.1 (t,3H) was assigned for a methine proton and the methylene of the Mannich base side chain.



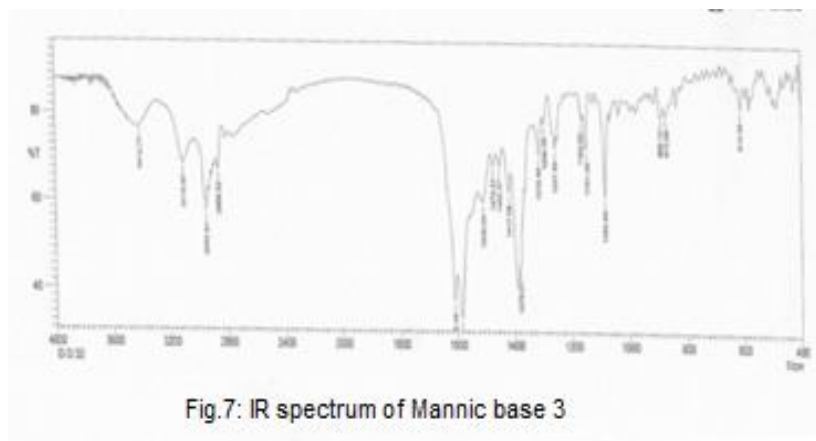
3.3- Synthesis of the Mannich base: : 2-pyrrolidinomethyl-5,5-dimethylcyclohexane-1,3-dione (3)

Mannich base (3) was synthesized by adding formalin dropwise to a mixture of dimedone and pyrrolidine in absolute ethanol at room temperature .

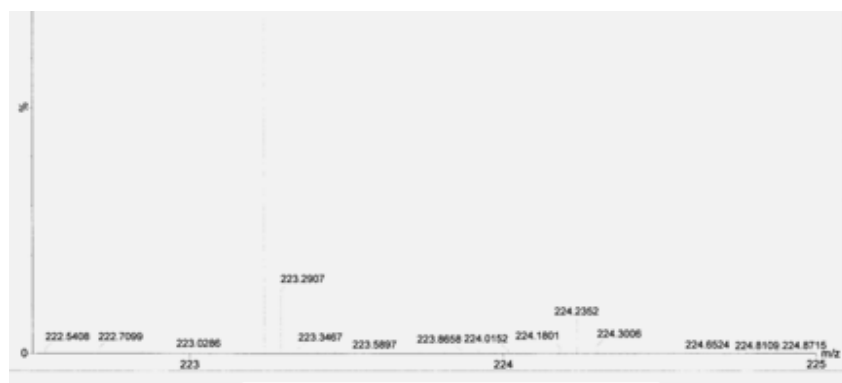


(3)

IR spectrum (Fig.7) showed ν (KBr), 1151 (C-N) , 1610 (C=O) and 2952 (C-H, aliph.) .



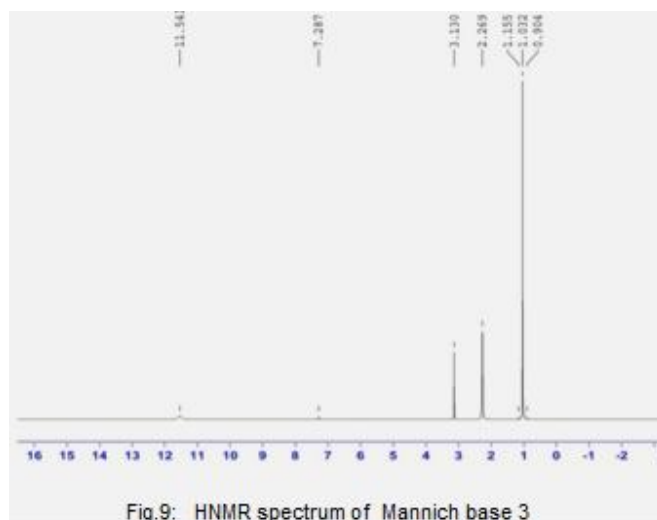
The Mass spectrum (Fig.8) gave m/z 223 for $M^{+}+1$.



The ^1H NMR spectrum (Fig.9) revealed the following signals:

δ 0.9-1.15	multiplet	10H
δ 2.26	singlet	8H
δ 3.12	singlet	3H

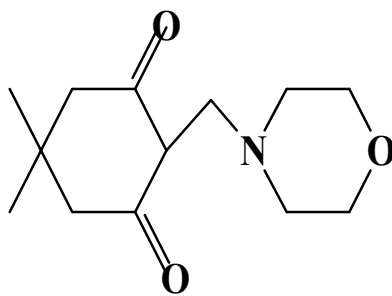
The signal at δ 0.9- 1.15 (m,10H) was assigned for the two methyl groups and two methylene groups of pyrrolidine (not neighbouring of N atom) ,while the singlet at δ 2.26(8H) corresponds to the 4 methylene groups of dimedone and pyrrolidine moieties .The signal at δ 3.12 (s,3H) was assigned for a methine proton and methylene of the Mannich base side chain.



Structure (3) above was assigned for the Mannich base (3).

3.4- Synthesis of the Mannich base: : 2-morpholinomethyl-5,5-dimethyl-cyclohexane-1,3-dione (4)

Mannich base (4) was synthesized by adding formalin dropwise to a mixture of dimedone and morpholine in absolute ethanol at room temperature .



(4)

IR spectrum (Fig.10) showed $\nu(\text{KBr})$, 1294 (CN) , 1612 (C=O) and 2966 (C-H,aliph.) .

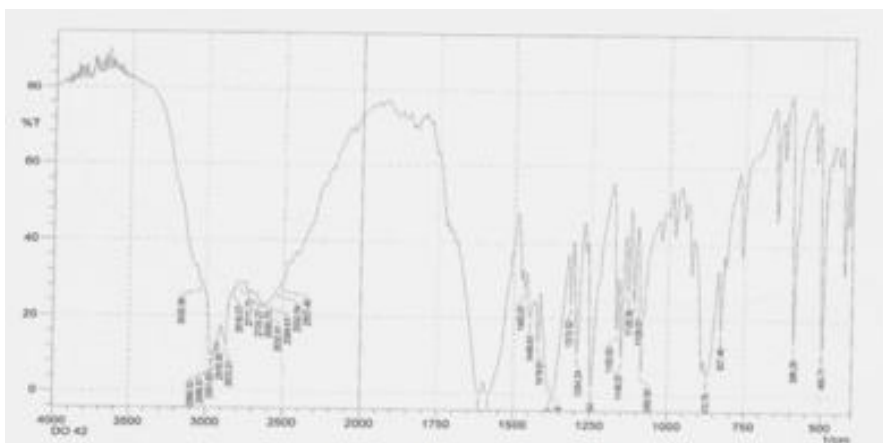


Fig. 10: IR spectrum of Mannich base 4

The Mass spectrum (Fig.11) gave m/z 237 for $M^{+}+1$.



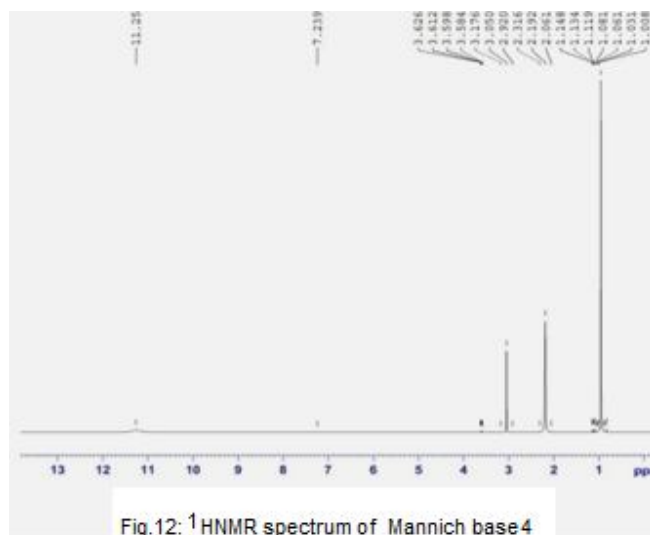
Fig. 11: Mass spectrum of Mannich base 4

The ^1H NMR spectrum (Fig.12) revealed the following signals:

δ 1.08	singlet	6H
δ 2.19	singlet	4H
δ 3.05	singlet	3H
δ 3.58-3.62	multiplet	8H

The singlet at δ 1.08 (s,6H) was assigned for two methyl groups, while the signal at δ 2.19(s,4H) corresponds to the two methylene groups of dimedone moieties. The signal at δ 3.05

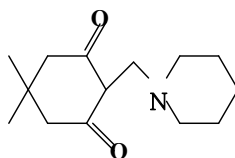
(s,3H) was assigned for a methine proton and methylene of the Mannich base side chain. The multiplet δ 3.58-3.62 (8H) was assigned for the four methylene groups of morpholine.



On the basis of the above data Mannich base 4 was assigned structure 4 above.

3.5- Synthesis of the Mannich base: 2-piperidinomethyl-5,5-dimethylcyclohexane-1,3-dione (5)

Mannich base (5) was synthesized by adding formalin dropwise to a mixture of dimedone and piperidine in absolute ethanol at room temperature .



(5)

IR spectrum (Fig.13) showed ν (KBr), 1247 (CN) , 1610 (C=O) and 2966 (C-H,aliph.) .

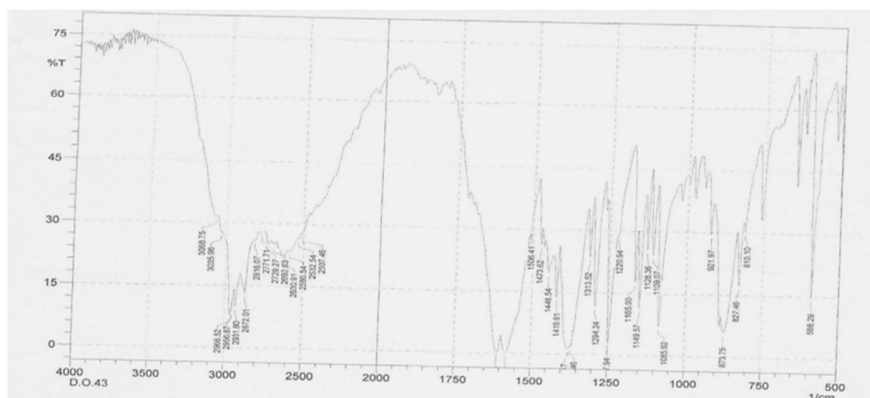


Fig. 13: IR spectrum of Mannich base 5

The Mass spectrum (Fig.14) gave m/z 237 for $M^{+}+1$.

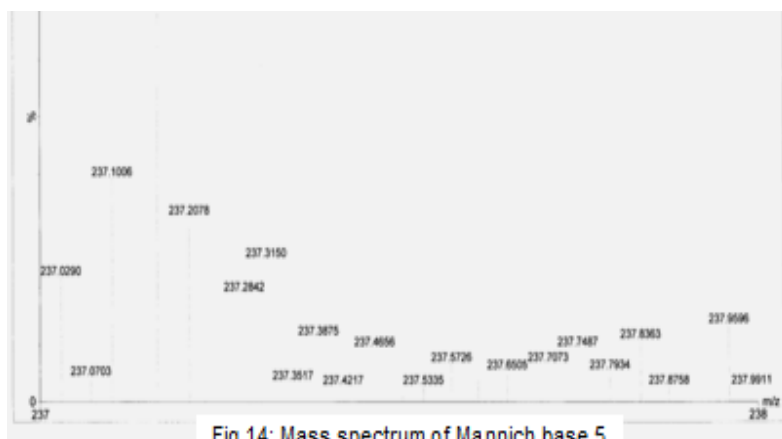


Fig.14: Mass spectrum of Mannich base 5

The ^1H NMR spectrum (Fig.15) revealed the following signals:

δ 0.95	Singlet	6H
δ 2.25	Singlet	6H
δ 2.48	Singlet	8H
δ 3.04	Singlet	2H
δ 3.48	Singlet	1H

The signal at δ 0.95 (s,6H) was assigned for the two methyl groups, while the signal at δ 2.25(s,6H) corresponds to the three methylene groups (\square). The singlet at δ 2.48 (8H) was assigned for the four methylenes of dimedone and piperidine moieties. The

signal at $\delta 3.04$ (s,2H) was assigned for the methylene group the Mannich base side chain ,while the signal at $\delta 3.48$ (s,1H) corresponds to the methine proton.

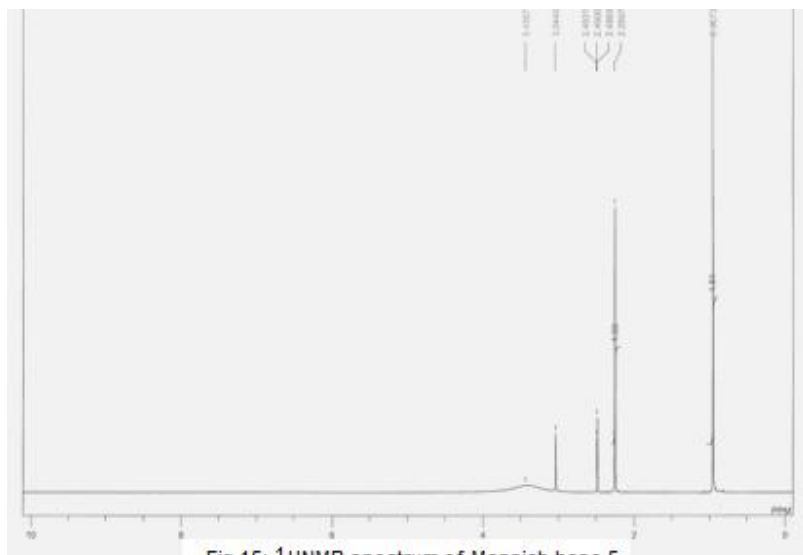
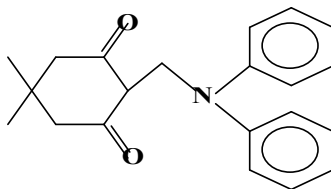


Fig.15: ¹H NMR spectrum of Mannich base 5

On the basis of the above data structure (5) above was proposed for this Mannich base.

3.6- Synthesis of the Mannich base: 2-diphenylaminomethyl-5,5-dimethylcyclohexane-1,3-dione(6)

The Mannich base (6) was synthesized by adding formaline dropwise to a mixture of dimedone and diphenylamine in absolute ethanol at room temperature.



(6)

The IR spectrum (Fig.16) showed $\nu(\text{KBr})$, 758,827,875(C-H, Ar., bending) ,1128 (CN) , 1419, 1448(C=C, Ar) , 1614 (C=O) and 2931 (C-H,aliph.) .

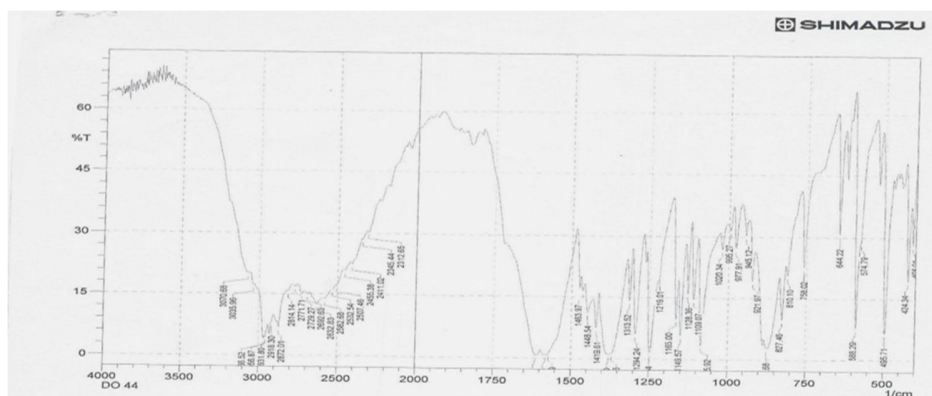


Fig. 16: IR spectrum of Mannich base 6

The Mass spectrum(Fig.17) gave m/z 321 for M^++1 .

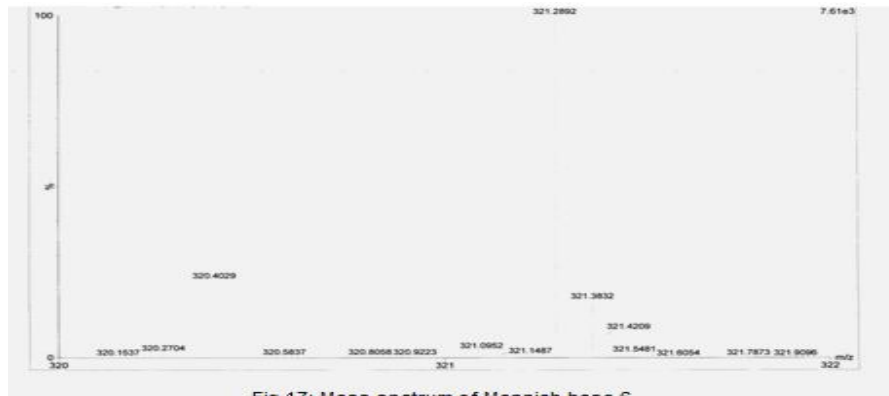
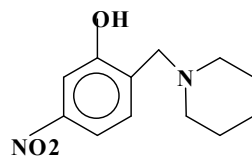


Fig.17: Mass spectrum of Mannich base 6

Structure (6) was proposed for this Mannich base.

3.7- Synthesis of the Mannich base: 2-piperidinomethyl-5-nitrophenol (7)

Mannich base (7) was synthesized by adding formalin dropwise to a mixture of 3-nitrophenol and piperidine in absolute ethanol at room temperature .



(7)

The IR spectrum (Fig.18) showed $\nu(\text{KBr})$: 862, 943,947 (C-H, Ar. , bending),1163(C-N), 1438,1460 (C=C, Ar), 1600(C=O), 2526(C-H,aliph.) and $3196\text{cm}^{-1}(\text{OH})$.

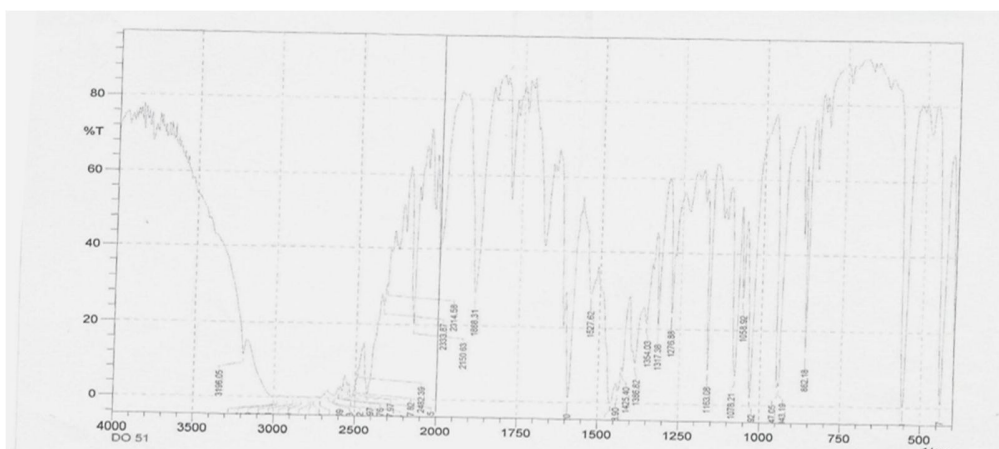


Fig. 18: IR spectrum of Mannich base 7

The Mass spectrum (Fig.19)gave m/z 236 for M^++1 .

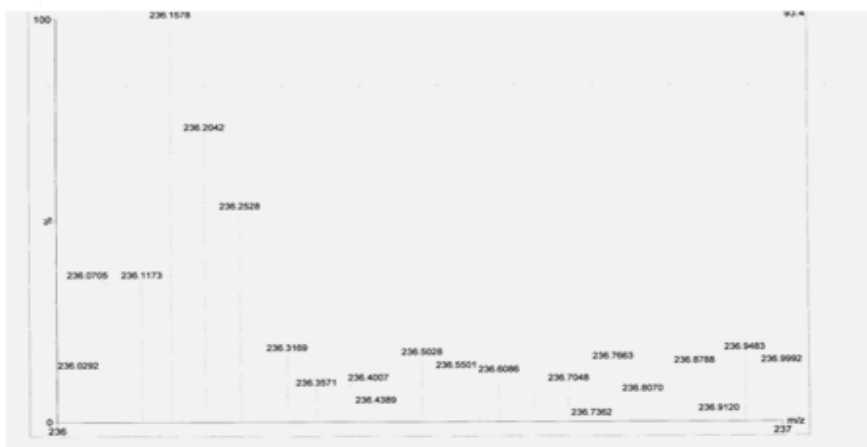


Fig.19 : Mass spectrum of Mannich base 7

The ^1H NMR spectrum (Fig.20) revealed the following signals:

δ 1.51-1.67	multiplet	6H
δ 2.49	singlet	4H
δ 3.36	singlet	2H
δ 7.67	singlet	3H
δ 8.94	singlet	1H

The multiplet at δ 1.51-1.67 (6H) was assigned for the three methylene groups of piperidine moiety(not neighbouring of N atom),while the resonance at δ 2.49(s,4H) corresponds to two methylene groups (neighbouring N in piperidine) .The singlet at δ 3.36 (2H) was assigned for the methylene group of the Mannich base side chain . The aromatic protons resonate as a singlet at δ 7.67(3H),while the signal at δ 8.94(s,1H) corresponds to the proton of phenolic OH function.

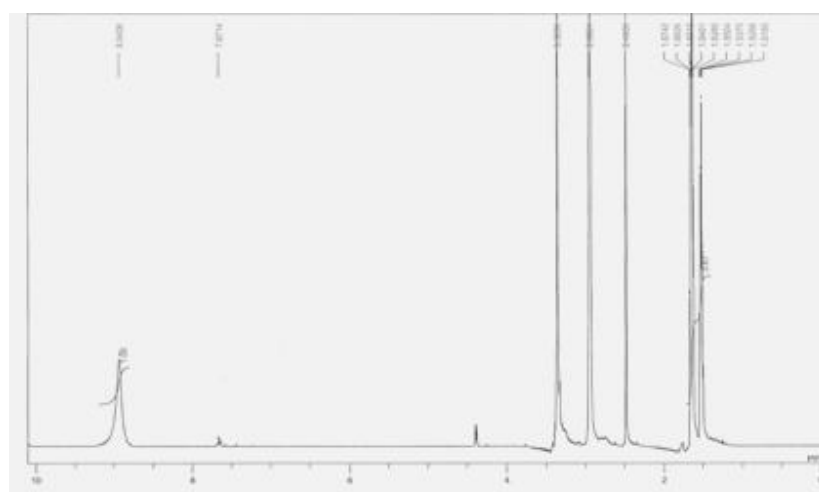
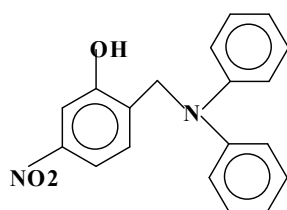


Fig.20: ^1H NMR spectrum of Mannich base 7

On the basis of the above data, structure (7) above was proposed for this Mannich base.

3.8- Synthesis of the Mannich base: 2-diphenylaminomethyl-5-nitrophenol (8)

Mannich base (8) was synthesized by adding formaline dropwise to a mixture of 3-nitrophenol and diphenylamine in absolute ethanol at room temperature .



(8)

IR spectrum (Fig.21) showed $\nu(\text{KBr})$: 650, 750,820 (C-H, Ar. , bending),1175(C-N), 1500,1510 (C=C, Ar.), 2900(C-H,aliph.) and 3400cm^{-1} (OH,Ar.).

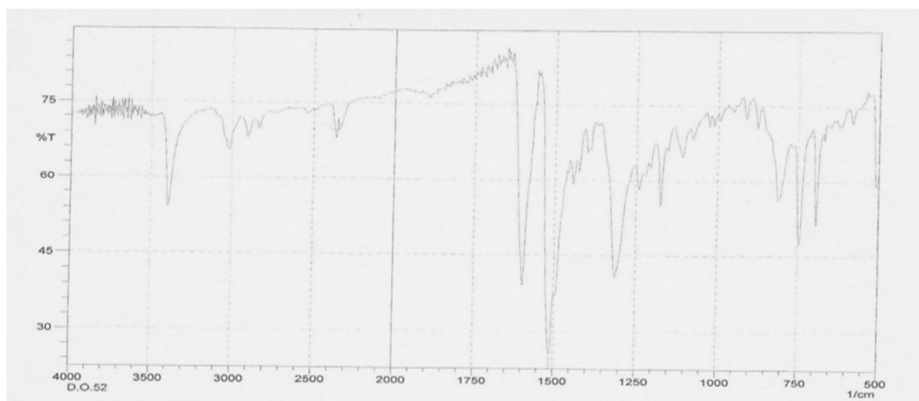


Fig.21: IR spectrum of Mannich base 8

The Mass spectrum (Fig.22) gave m/z 320 for $M^{+}+1$.

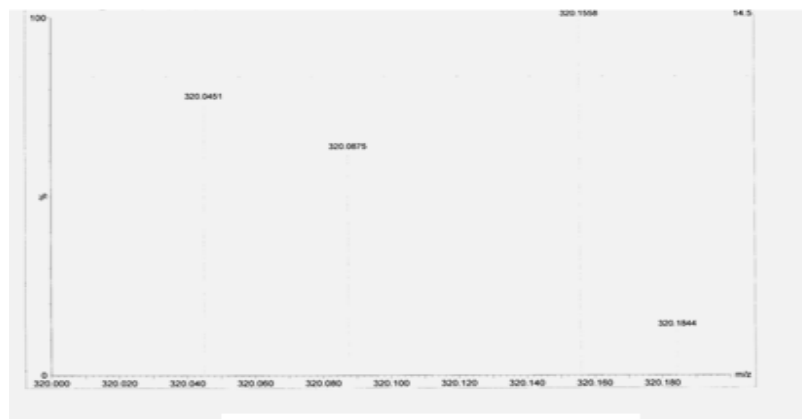


Fig.22: Mass spectrum of Mannich base 8

The ^1H NMR spectrum (Fig.23) revealed the following signals:

δ 3.71	singlet	2H
δ 6.73-7.19	multiplet	13H
δ 7.93	singlet	1H

The singlet at δ 3.71 (2H) was assigned for the methylene group of the Mannich base side chain, while the multiplet at δ 6.73-7.19(13H) corresponds to the aromatic protons. The resonance at δ 7.93 (s,1H) corresponds to the proton of phenolic group.

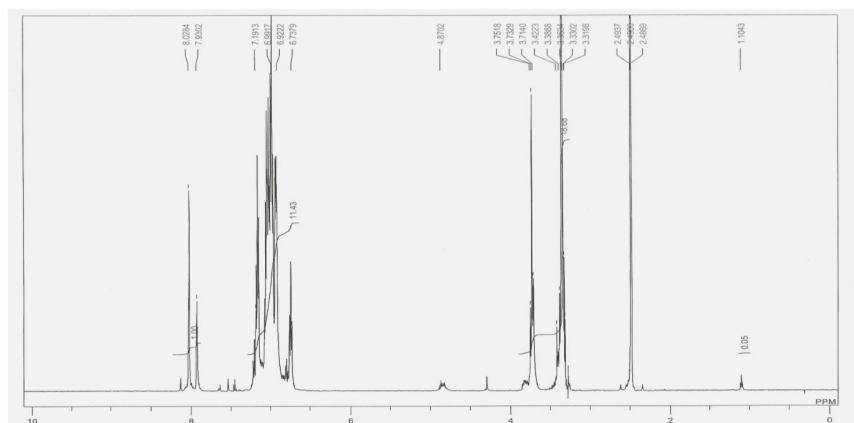
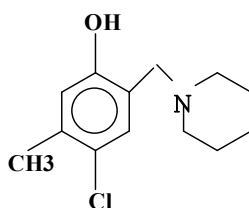


Fig. 23: ^1H NMR spectrum of Mannich base 8

Structure (8) above was suggested for this Mannich base.

3.9- Synthesis of the Mannich base: 2-piperidinomethyl-4-chloro-5-methylphenol(9)

Mannich base (9) was synthesized by adding formalin dropwise to a mixture of 4-chlorocresol and piperidine in absolute ethanol at room temperature .



(9)

The Mass spectrum (Fig.24)gave m/z 239 for $M^{+}+1$.

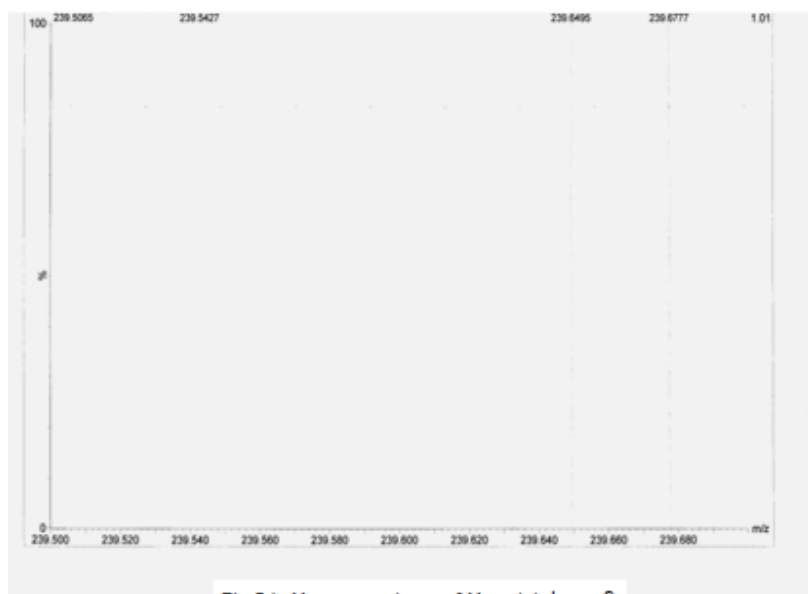


Fig.24: Mass spectrum of Mannich base 9

The ^1H NMR spectrum (Fig.25) revealed the following signals:

δ 1.51	triplet	6H
δ 2.52	singlet	3H
δ 2.83	triplet	4H
δ 3.41	singlet	2H
δ 6.59	doublet	1H
δ 7.0	doublet	1H
δ 9.04	singlet	1H

The signal at δ 1.51(t,6H) was assigned for the three methylene groups of piperidine moiety(not neighbouring of N atom),while the signal at δ 2.52(s,3H) corresponds to the methyl group of aromatic ring .The resonance at δ 2.83 (t,4H) was assigned for the two methylene groups of piperidine moiety(neighbouring of N atom). The signal at δ 3.41 (s,2H) was assigned for the methylene group the Mannich base side chain . The aromatic protons resonate as a doublet at δ 6.59 (1H, proton neighbouring the OH function and doublet at δ 7.0 (1H, proton neighbouring Cl). The resonance at δ 9.04(s,1H) corresponds to the phenolic OH function.

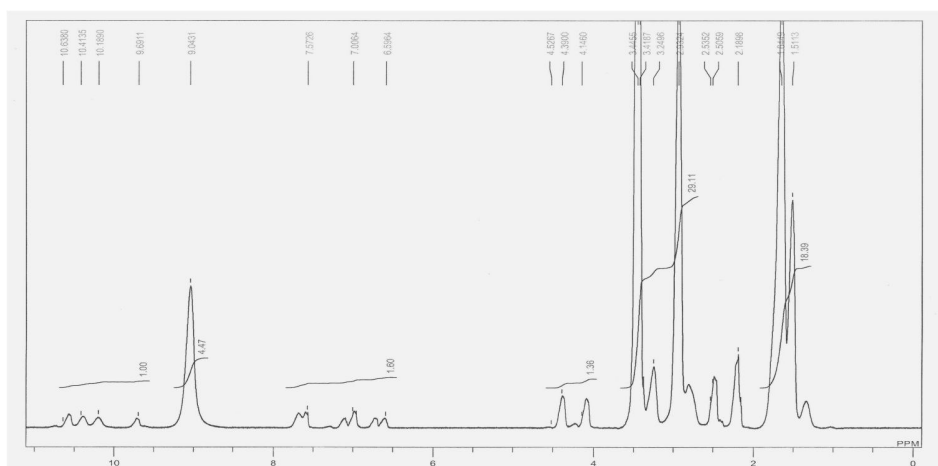
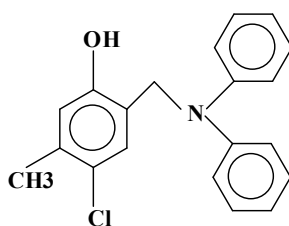


Fig. 25: ^1H NMR spectrum of Mannich base 9

On the basis of the above spectral data structure (9) above was proposed for this Mannich base.

3.10- Synthesis of the Mannich base : 2-diphenylaminomethyl-4-chloro-5-methylphenol (10)

Mannich base (10) was synthesized by adding formalin dropwise to a mixture of 4-chlorocresol and diphenylamine in absolute ethanol at room temperature .



(10)

IR spectrum (Fig.26) showed $\nu(\text{KBr})$: 640, 700,800 (C-H, Ar. , bending), 750(C-Cl,Ar.),1250(C-N) , 1300(CH₃,Ar.) 1450 ,1500 (C=C, Ar), and 3400cm⁻¹(OH,Ar.).

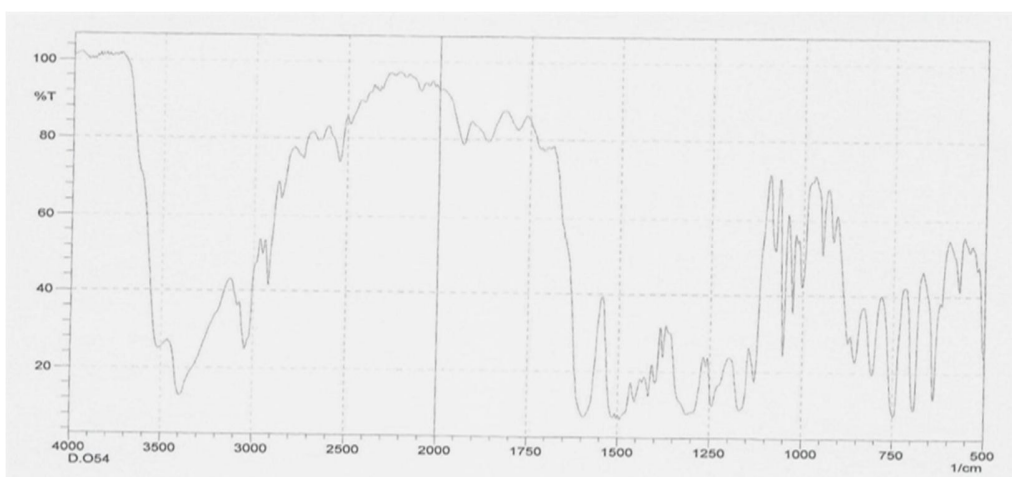


Fig.26: IR spectrum of Mannich base 10

The ^1H NMR spectrum (Fig.27) revealed the following signals:

δ 2.84	singlet	3H
δ 4.06	singlet	2H
δ 7.35-7.85	multiplet	12H
δ 8.77	singlet	1H

The singlet at δ 2.84 (3H) was assigned for the methyl group, while the signal at δ 4.06(s,2H) corresponds to the methylene group the Mannich base side chain. The multiplet at δ 7.35-7.85 (12H) was assigned for the aromatic protons, while the signal at δ 8.77(s,1H) corresponds to phenolic OH function.

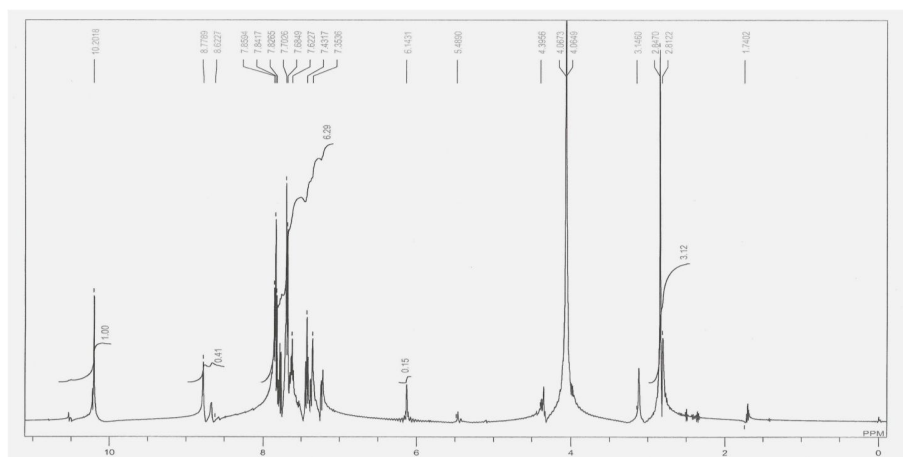
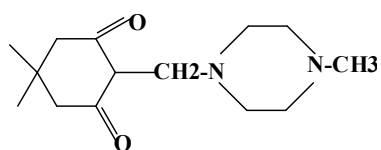


Fig. 27 : ^1H NMR spectrum of Mannich base 10

Structure (10) above was proposed for this Mannich base.

3.11- Synthesis of the Mannich base: 2-N-methylpiperizinomwthyl-5,5-dimethylcyclohexane-1,3-dione(11)

The Mannich base (11) was synthesized by adding formalin dropwise to a mixture of dimedone and N-methylpiperazine in absolute ethanol at room temperature .



(11)

IR spectrum (Fig.28) showed $\nu(\text{KBr})$: 1250 (N-C) ,1600 (C=O) , and 2990 (C-H, aliphatic) .

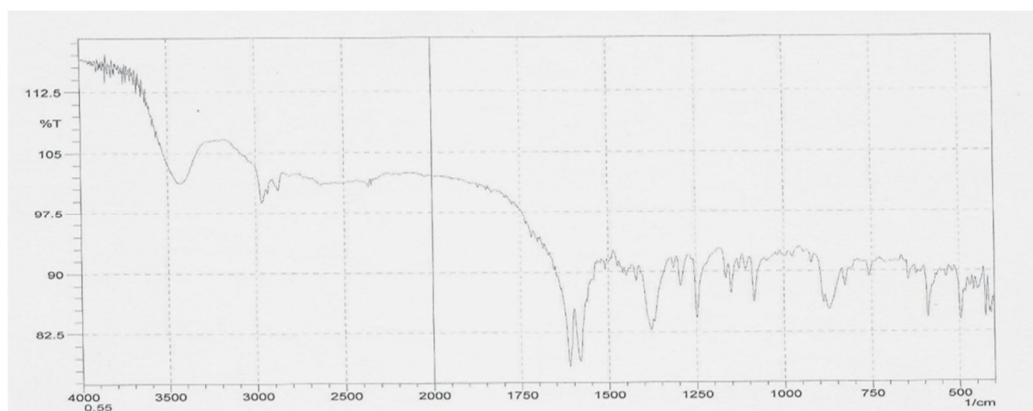


Fig.28 :IR spectrum of Mannich base 11

The Mass spectrum (Fig.29)gave m/z 252 for M^++1 .

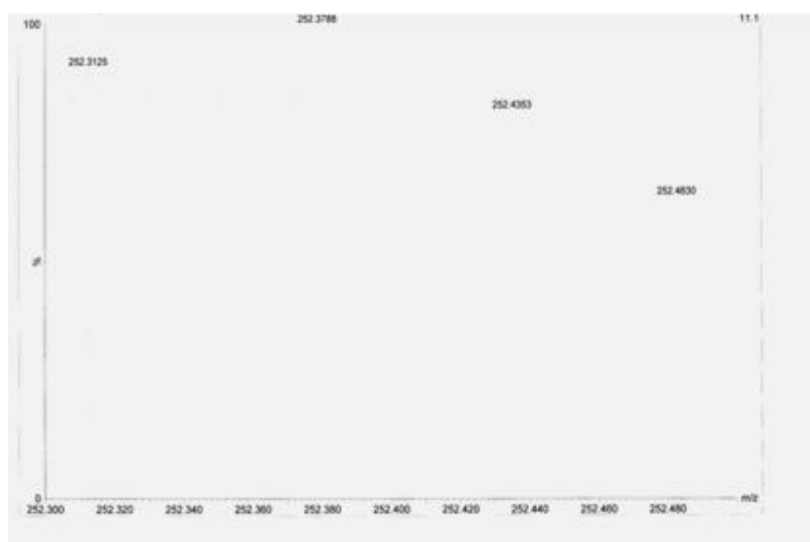
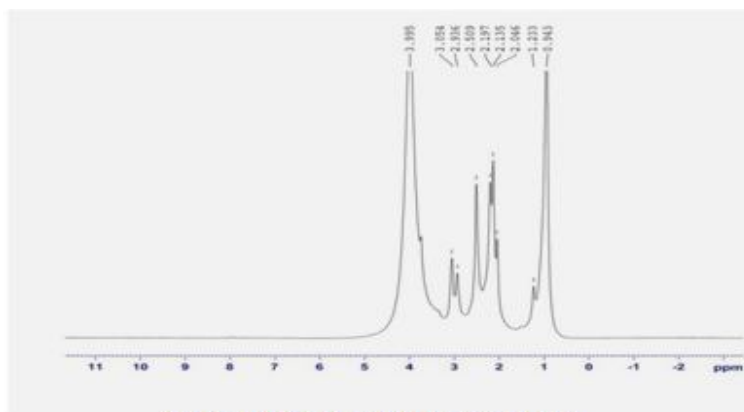


Fig.29: Mass spectrum of Mannich base 11

The ^1H NMR spectrum (Fig.30) revealed the following signals:

δ 0.94	singlet	6H
δ 2.04-2.19	multiplet	15H
δ 3.05	doublet	2H
δ 3.99	singlet	1H

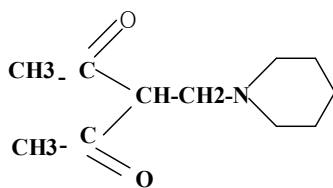
The signal at δ 0.94 (s, 6H) was assigned for the two methyl groups of dimedone moiety. The multiplet at δ 2.04 – 2.19 (15H) accounts for the other methyl group and six methylenes of dimedone and N-methylpiperazine moieties . The doublet at δ 3.05(2H) corresponds to the methylene of the Mannich base side chain , while the resonance at δ 3.99 (s,1H) corresponds to a methine proton.



On the basis of the above spectral data ,structure (11) above was proposed for this Mannich base.

3.12-Synthesis of the Mannich base :3-piperidinomethylpentane-2,4-dione (12)

The Mannich base (12) was synthesized by adding formalin dropwise to a mixture of acetylacetone and piperidine in absolute ethanol at room temperature.



12

IR spectrum (Fig.31) showed $\nu(\text{KBr})$: 1150 (N-C) , 1600 (C=O) and 2960cm^{-1} (C-H, aliph.).

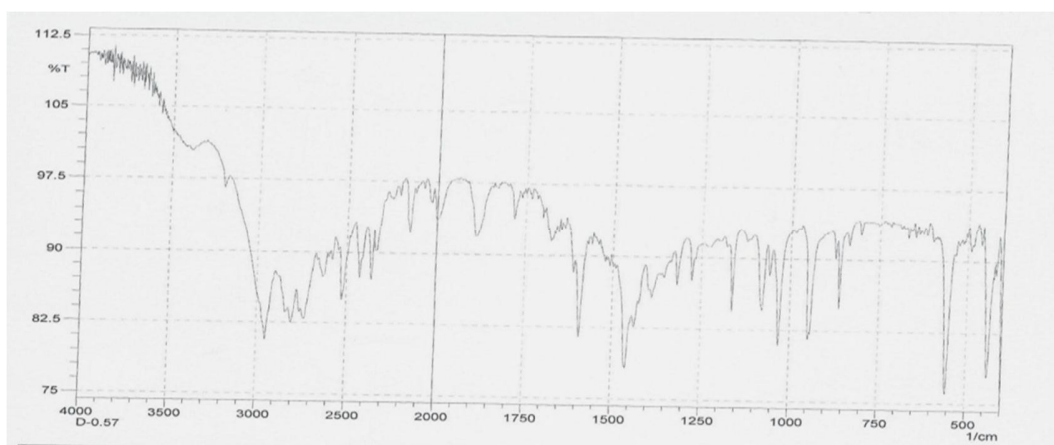


Fig. 31 : IR spectrum of Mannich base 12

The mass spectrum (Fig.32) gave m/z 197 for $M^{+}+1$.

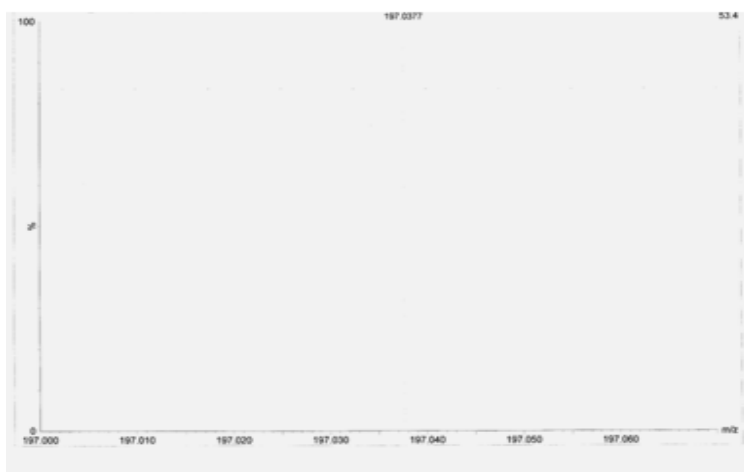
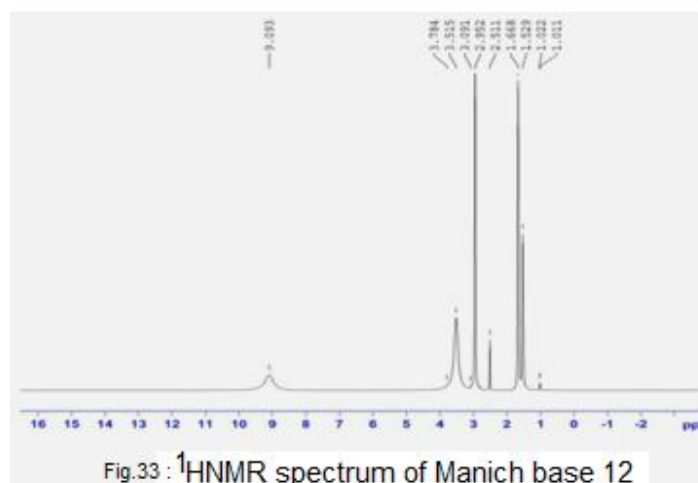


Fig. 32: Mass spectrum of Mannich base 12

The ^1H NMR (Fig.33) spectrum revealed the signals:

δ 1.59	doublet	6H
δ 2.51	singlet	10H
δ 3.02	singlet	2H
δ 3.51	singlet	1H

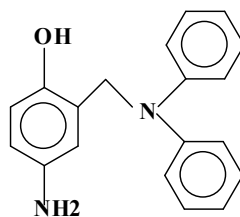
The signal at δ 1.59 (d,6H) was assigned for three methylene groups ($\text{—CH}_2\text{—}$), while the singlet at δ 2.51 (10H) corresponds to two methyl groups and two methylenes groups neighbouring N in pyridine moiety. The resonance at δ 3.02(s,2H) was assigned for the methylene of the Mannich base side chain . The signal at δ 3.51(s,1H) was assigned for a methine proton.



Structure (12) above was assigned for this Mannich base.

3.13-Synthesis of the Mannich base: 2-diphenylaminomethyl-4-aminophenol(13)

Mannich base (13) was synthesized by adding formalin dropwise to a mixture of 4-aminophenol and diphenylamine in absolute ethanol at room temperature .



(13)

The Mass spectrum (Fig.34)gave m/z 290 for $M^{+}+1$.

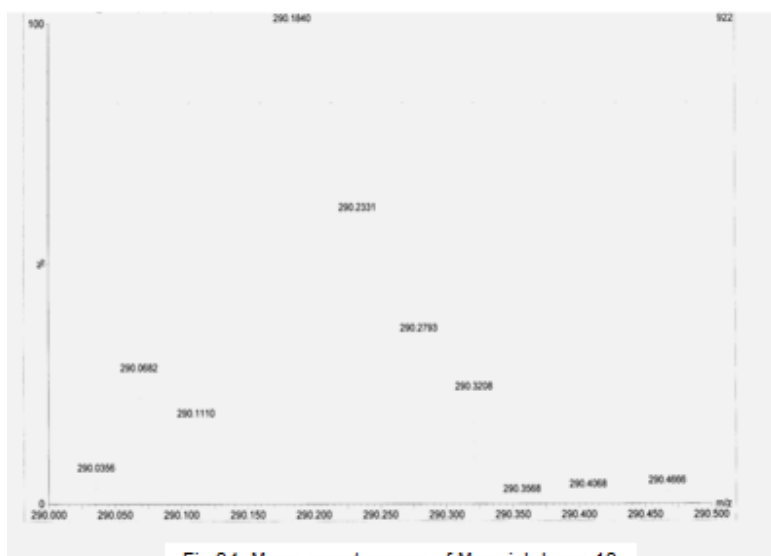


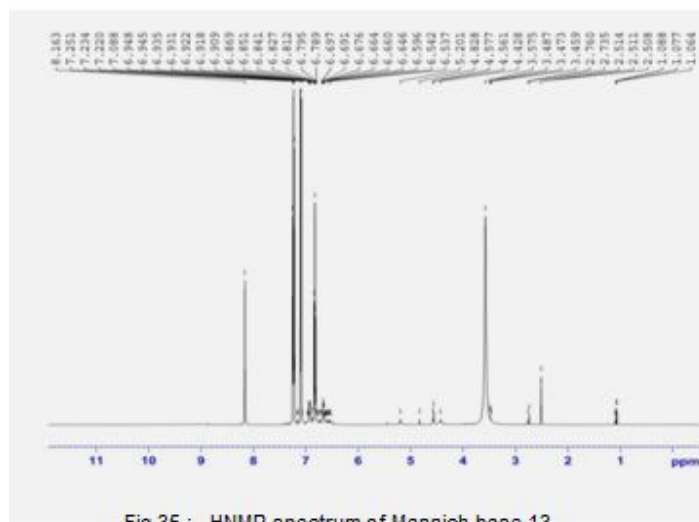
Fig.34: Mass spectrum of Mannich base 13

The ^1H NMR spectrum (Fig.35) revealed the following signals:

δ 3.57	singlet	2H
δ 5.2	singlet	2H
δ 6.81	triplet	3H
δ 7.05	doublet	2H
δ 7.21	triplet	8H
δ 8.16	singlet	1H

The signal at δ 3.57 (s,2H) was assigned for the methylene group the Mannich base side chain ,while the resonance at δ 5.2 (s,2H) corresponds to the amino protons . The aromatic protons resonate

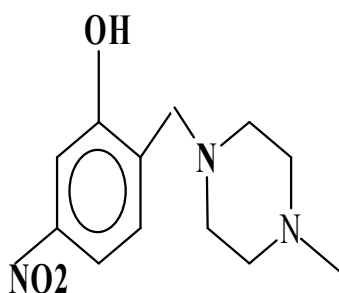
as a triplet at $\delta 6.81$ (3H), a doublet at $\delta 7.05$ (2H) and a triplet at $\delta 7.21$ (8H). The signal at $\delta 8.16$ (s, 1H) corresponds to the phenolic OH function.



Structure (13) above was suggested for this Mannich base.

3.14- Synthesis of the Mannich base: 2-N-methylpiperzinomethyl-5-nitrophenol (14)

Mannich base (14) was synthesized by adding formalin dropwise to a mixture of 3-nitrophenol and N,methylpiperazine in absolute ethanol at room temperature .



(14)

The Mass spectrum (Fig.36) gave m/z 251 for $M^{+}+1$.

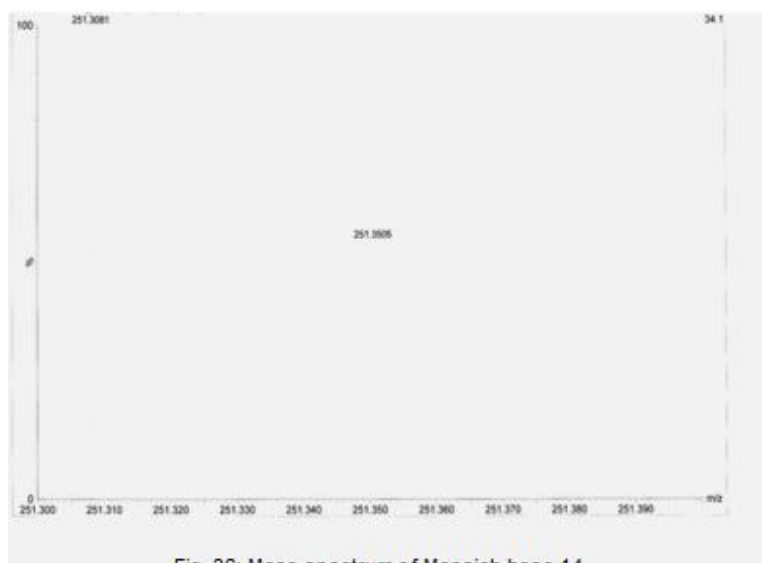
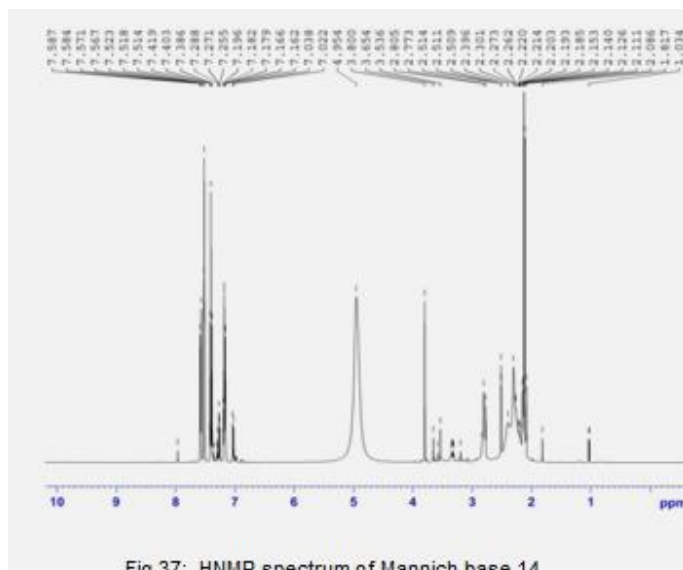


Fig. 36: Mass spectrum of Mannich base 14

The ^1H NMR spectrum (Fig.37) revealed the following signals:

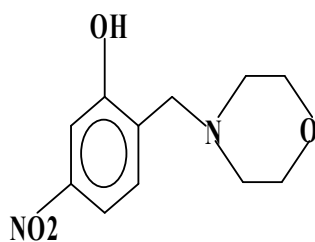
δ 2.08-2.80	multiplet	8H
δ 3.8	singlet	5H
δ 7.02-7.58	multiplet	3H
δ 7.96	singlet	1H

The multiplet at δ 2.08-2.80 (8H) was assigned for the four methylene groups of the N-methylpiperazine moiety, while the resonance at δ 3.8 (s,5H) corresponds to the methylene group of the Mannich base side chain and a methyl group . The multiplet at δ 7.02-7.58 (3H) corresponds to the aromatic protons ,while the signal at δ 7.96 (s,1H) corresponds to the proton of phenolic OH function.



3.15- Synthesis of the Mannich base: 2-morpholinomethyl-5-nitrophenol (15)

Mannich base (15) was synthesized by adding formalin dropwise to a mixture of 3-nitrophenol and morpholine in absolute ethanol at room temperature .



(15)

The IR spectrum (Fig.38) showed $\nu(\text{KBr})$: 740, 800,850 (C-H, Ar. , bending),1100(C-N), 1450,1500 (C=C, Ar), 1600(C=O), 2990 (C-H,aliph.) and 3100cm^{-1} (OH).

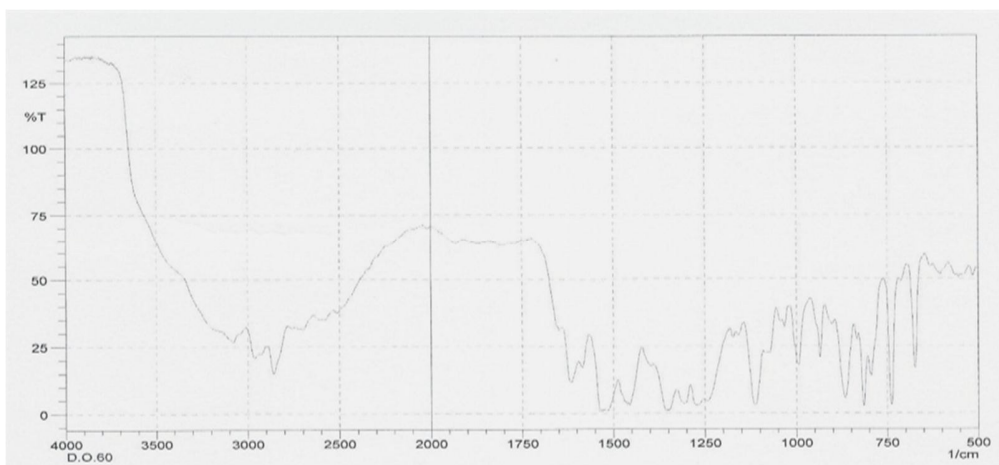


Fig.38 : IR spectrum of Mannich base 15

The Mass spectrum (Fig.39) gave m/z 238 for $M^+ + 1$.

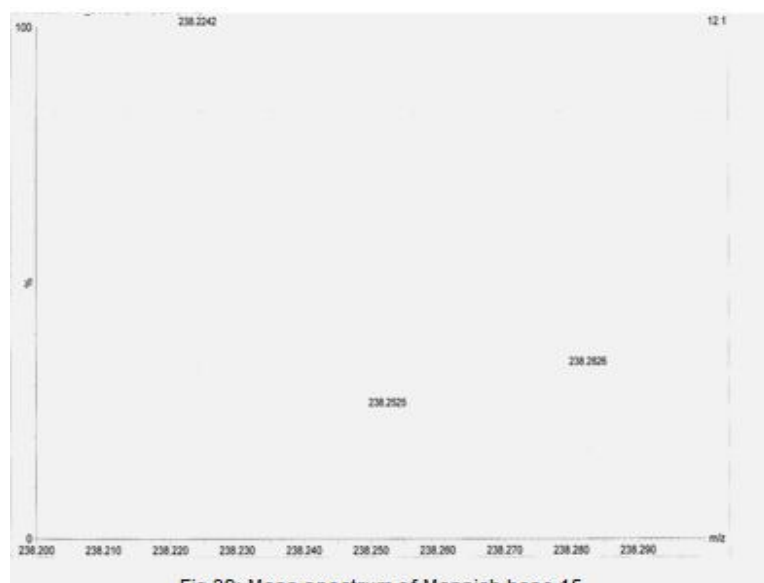


Fig.39: Mass spectrum of Mannich base 15

The ^1H NMR spectrum (Fig.40) revealed the following signals:

δ 2.1-2.51	multiplet	4H
δ 3.25-3.77	multiplet	6H
δ 6.95-7.62	multiplet	3H

The multiplet at δ 2.1-2.51(4H) was assigned for two methylenes neighbouring oxygen in the morpholine moiety, while the resonance at δ 3.25-3.77(m,6H) accounts for the other methylenes of morpholine and methylene group of the Mannich base side chain. The aromatic protons resonate as a multiplet) at δ 6.95-7.62(3H).

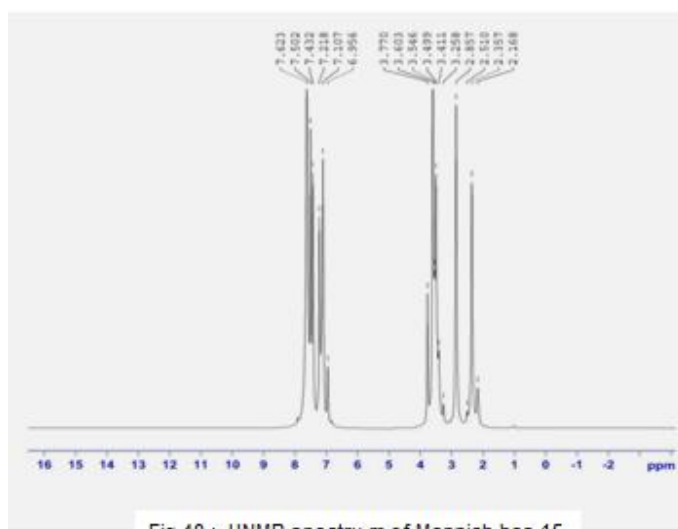
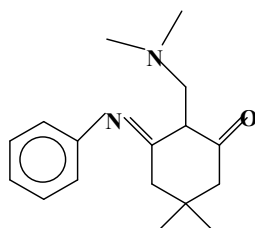


Fig.40 : HNMR spectrum of Mannich base 15

On the basis of the above spectral data, structure (15) above was assigned for this Mannich base.

3.2-Synthesis of the Schiff base : (E)-2-(dimethylaminomethyl)-5,5-dimethyl-3-(phenylimino)cyclohexanone(16)

The Schiff base (16) was synthesized via the reaction of the Mannich base (I) with aniline.



16

IR spectrum (Fig.41) showed $\nu(\text{KBr})$: 613, 738, 873 (C-H, Ar. , bending), 1245(C-N), 1377 (C=C, Ar.), 1581(C=N), 1610(C=O) and 2964cm^{-1} (C-H,aliph.) .

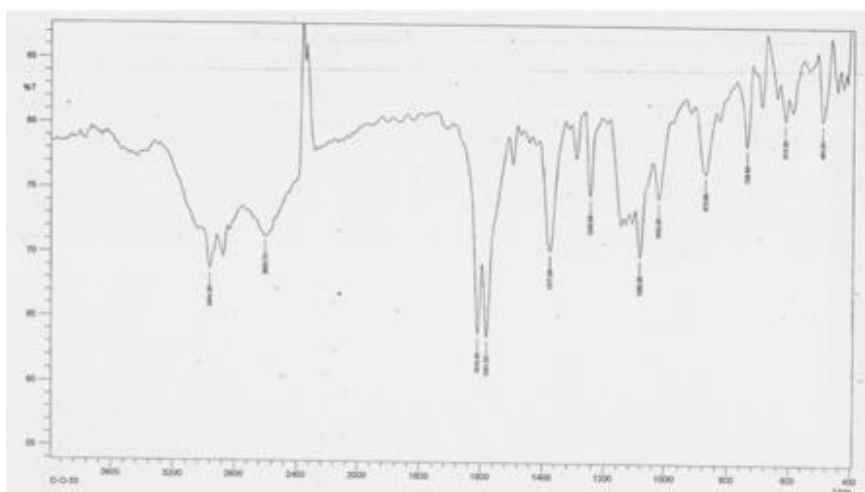


Fig.41: IR spectrum of Schiff base 16

The Mass spectrum (Fig.42) gave m/z 272.17 for $M^{+}+1$.

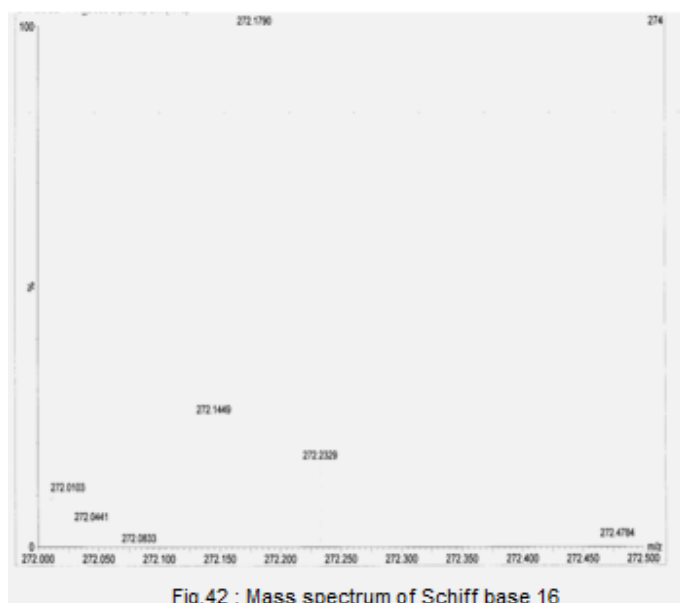


Fig.42 : Mass spectrum of Schiff base 16

The ^1H NMR spectrum (Fig.43) revealed the following signals:

δ 0.99	doublet	8H
δ 2.25	singlet	6H
δ 2.49	singlet	2H
δ 2.65	singlet	1H
δ 3.05	singlet	2H
δ 6.94	doublet	2H
δ 7.24	triplet	3H

The signal at δ 0.99 (d,8H) was assigned for the two methyl groups and methylene group neighbouring of carbonyl group (of dimedone moiety) ,while the singlet at δ 2.25 (6H) corresponds to the two methyl groups (N^{\leftarrow}) . The signal at δ 2.49 (s,2H) was assigned for the other methylene group of dimedone moiety . The resonance at δ 2.65(s,1H) was assigned for a methine proton , while the singlet at δ 3.05 (2H) corresponds to the methylene of the Mannich base side chain. The aromatic protons resonate as a doublet at δ 6.94(2H) for the proton neighbouring of N atom and as triplet at δ 7.24(3H) for the other aromatic protons.

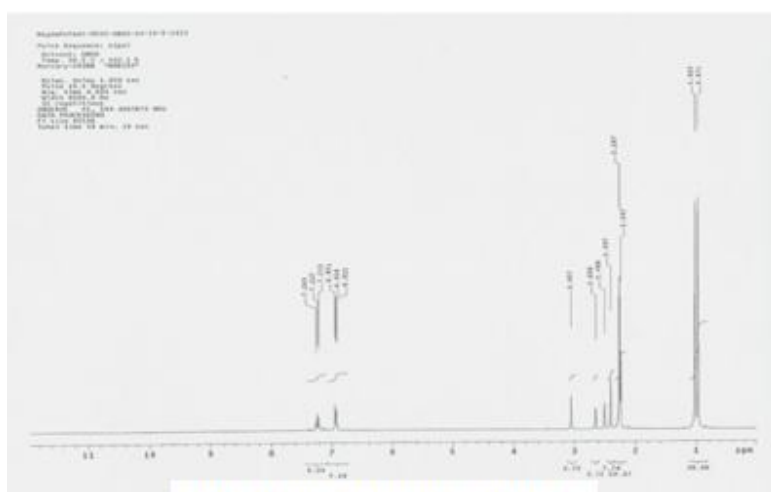
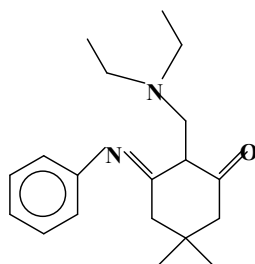


Fig.43: ^1H NMR spectrum of Schiff base 16

3.17- Synthesis of the Schiff base: (E)-2-(dimethylaminomethyl)-5,5-dimethyl-3-(phenylimino)cyclohexanone(17)

The Schiff base (17) was synthesized via the reaction of the Mannich base (2) with aniline.



17

IR spectrum (Fig.44) showed $\nu(\text{KBr})$ 584,871 (C-H, Ar. , bending),1245(C-N), 1377 (C=C, Ar.), 1581(C=N), 1610(C=O) and 2964cm^{-1} (C-H,aliph.) .

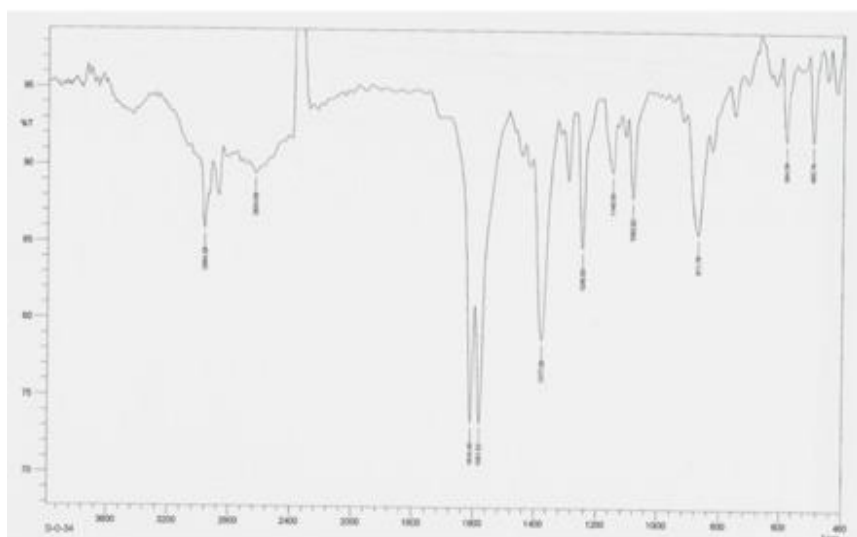
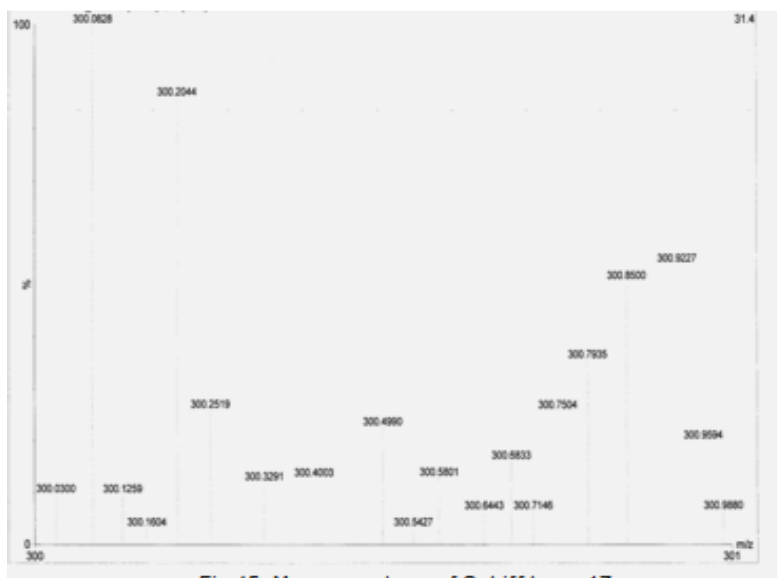


Fig.44: IR spectrum of Schiff base 17

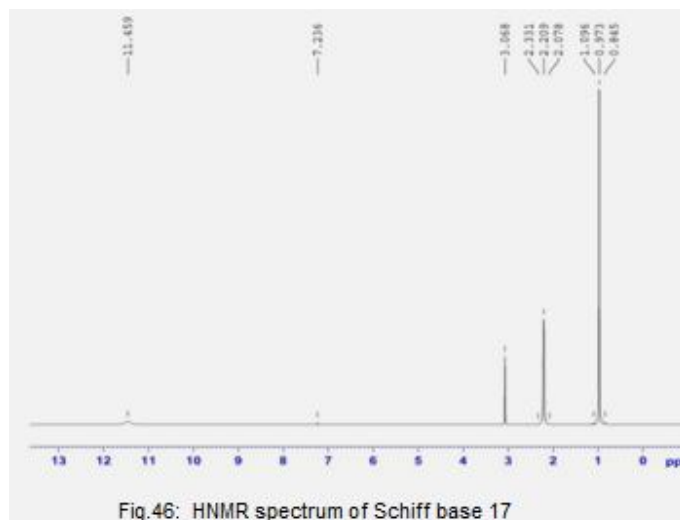
The Mass spectrum (Fig.45) gave m/z 300.08 for $M^{+}+1$.



The ^1H NMR spectrum (Fig.46) revealed the following signals:

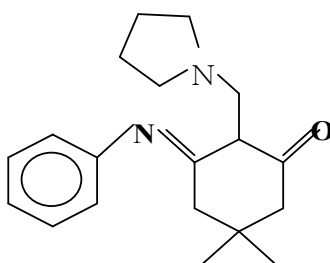
δ 0.97	singlet	14H
δ 2.2	singlet	7H
δ 3.06	singlet	2H
δ 7.23	singlet	5H

The singlet at δ 0.97 (14H) was assigned for the four methyl groups and methylene group neighbouring (C=N) in dimedone, while the signal at δ 2.2 (s,7H) corresponds to the other methylene groups and the methine proton. The singlet at δ 3.06 (2H) corresponds to the methylene group of the Mannich base side chain. The aromatic protons resonate as a singlet at δ 7.23 (5H) .



3.18- Synthesis of the Schiff base: (E)-5,5-dimethyl-3-(phenylimino)-2-(pyrrolidin-1-yl)cyclohexanone(18)

The Schiff base (18) was synthesized via the reaction of the Mannich base (3) with aniline.



18

IR spectrum (Fig.47) showed $\nu(\text{KBr})$: 588, 871 (C-H, Ar. , bending), 1245(C-N), 1377 (C=C, Ar.), 1581(C=N), 1610(C=O) and 2964cm^{-1} (C-H,aliph.) .

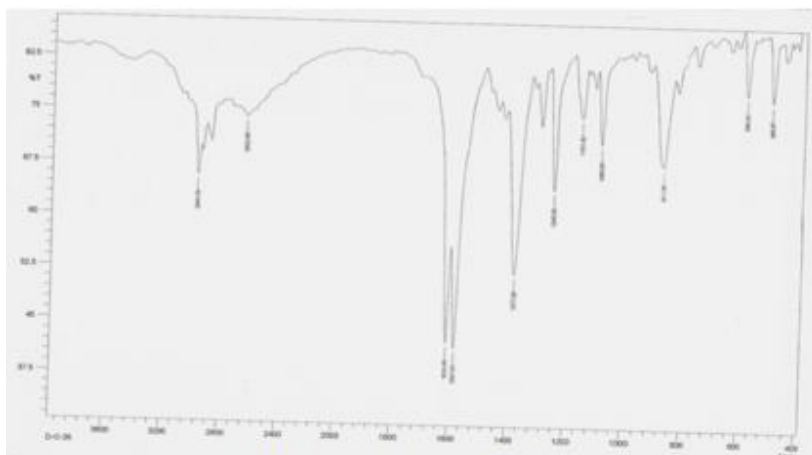


Fig.47: IR spectrum of Schiff base 18

The Mass spectrum (Fig.48) gave m/z 298.46 for M^{++1} .

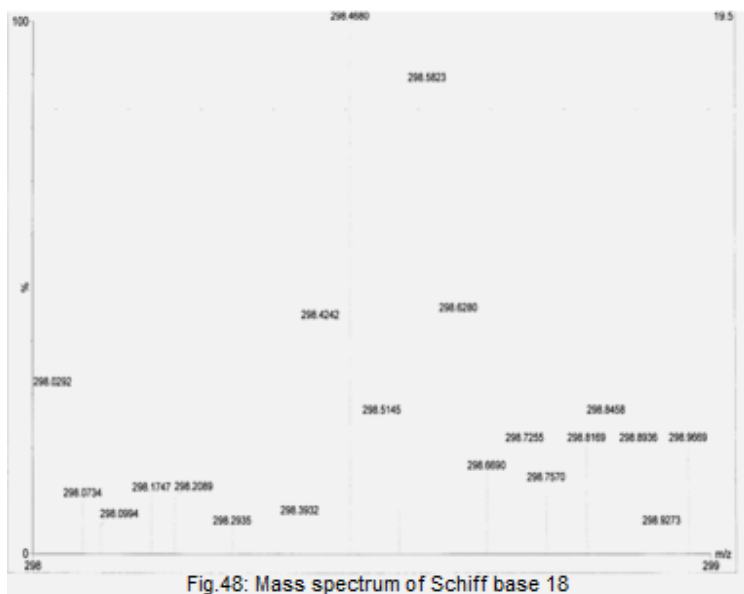


Fig.48: Mass spectrum of Schiff base 18

The ^1H NMR spectrum (Fig.49) revealed the following signals:

δ 0.96	singlet	6H
δ 1.56	singlet	2H
δ 2.25	triplet	11H
δ 3.13	singlet	2H
δ 7.24	singlet	5H

The signal at $\delta 0.96$ (s,6H) was assigned for two methyl groups (of dimedone moiety), while the singlet at $\delta 1.56$ (2H) corresponds to the methylene group neighbouring (C=N) in dimedone. The triplet at $\delta 2.25$ (11H) was assigned for the other five methylene groups and a methine proton. The singlet at $\delta 3.13$ (2H) corresponds to the methylene of the Mannich base side chain, while the aromatic protons resonate as a singlet at $\delta 7.24$ (5H).

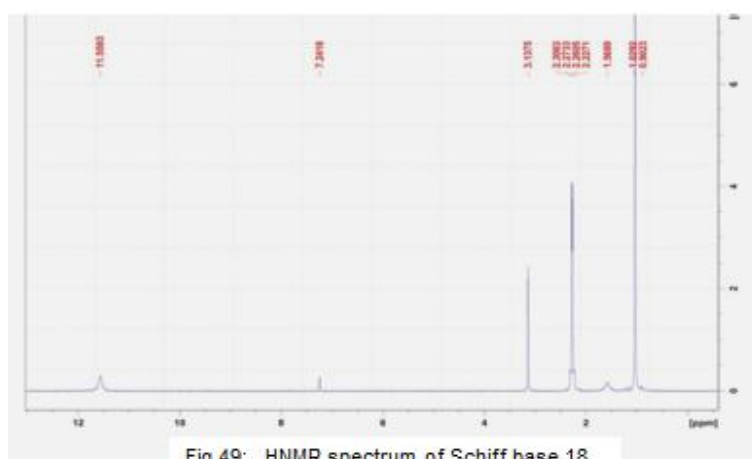
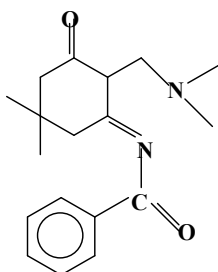


Fig.49: HNMR spectrum of Schiff base 18

3.19- Synthesis of the Schiff base: (E)-N-[2-(dimethylaminomethyl)-5,5-dimethyl-3-oxocyclohexylidene]benzamide(19)

The Schiff base (19) was synthesized via the reaction of the Mannich base (1) with benzamide.



19

IR spectrum (Fig.50) showed $\nu(\text{KBr})$ 594, 871 (C-H, Ar. , bending), 1245(C-N), 1377 (C=C, Ar.), 1581(C=N), 1610(C=O) and 2964cm^{-1} (C-H,aliph.) .

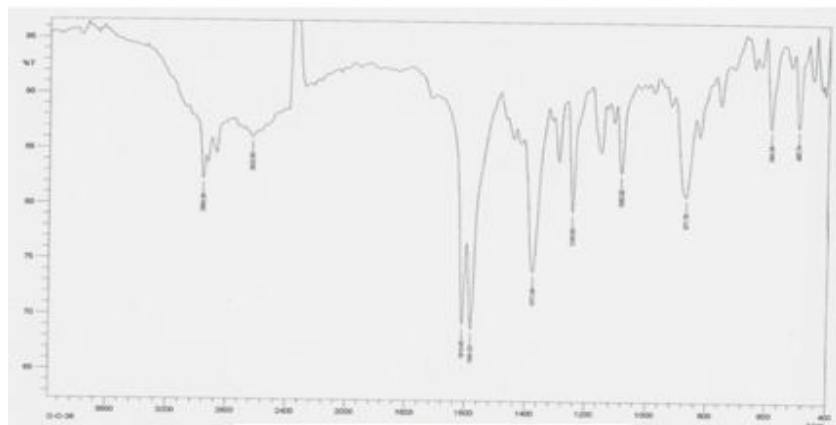


Fig. 50 : IR spectrum of Schiff base 19

The Mass spectrum (Fig.51) gave m/z 300.02 for $M^{+}+1$.

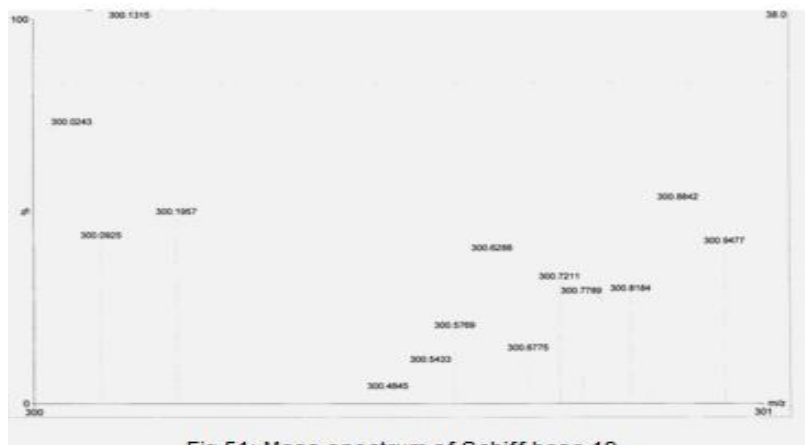


Fig.51: Mass spectrum of Schiff base 19

The ^1H NMR spectrum (Fig.52) revealed the following signals:

δ 0.82-1.13	multiplet	8H
δ 2.17	triplet	6H
δ 3.03	triplet	5H
δ 7.29	triplet	3H
δ 7.76	doublet	2H

The multiplet at $\delta 0.82-1.13(8H)$ was assigned for two methyl groups (of dimedone moiety) and methylene group neighbouring (C=O) in dimedone moiety, while the signal at $\delta 2.17$ (t, 6H) corresponds to the other methyl groups. The triplet at $\delta 3.03(5H)$ was assigned for the two methylene groups (of dimedone moiety and the Mannich base side chain) and a methine proton. The aromatic protons resonate as a triplet at $\delta 7.29(3H)$ and as a doublet at $\delta 7.76(2H)$ for the protons neighbouring the (C=O) function.

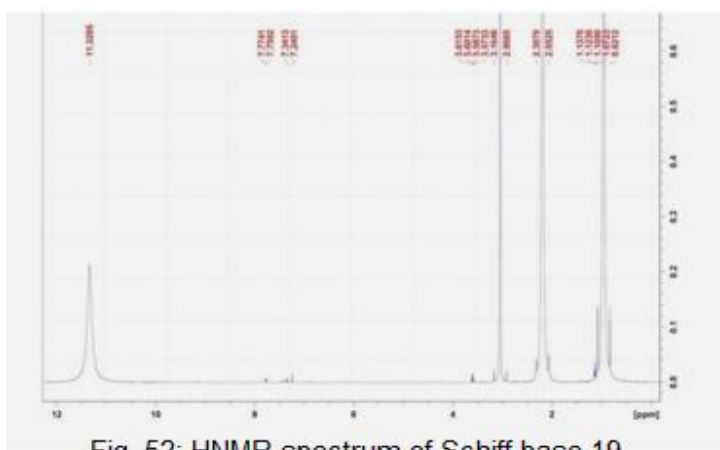
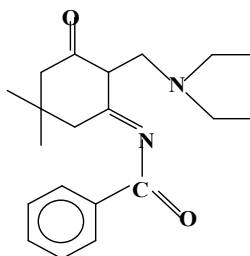


Fig. 52: HNMR spectrum of Schiff base 19

3.20- Synthesis of the Schiff base: (E)-N-[2-(diethylaminomethyl)-5,5-dimethyl-3-oxocyclohexylidene]benzamide(20)

The Schiff base (20) was synthesized via the reaction of the Mannich base (2) with benzamide.



20

IR spectrum (Fig.53) showed $\nu(\text{KBr})$ 586,756, 871 (C-H, Ar. , bending),1245(C-N), 1377 (C=C, Ar.), 1581(C=N), 1610(C=O) and 2964cm^{-1} (C-H,aliph.) .

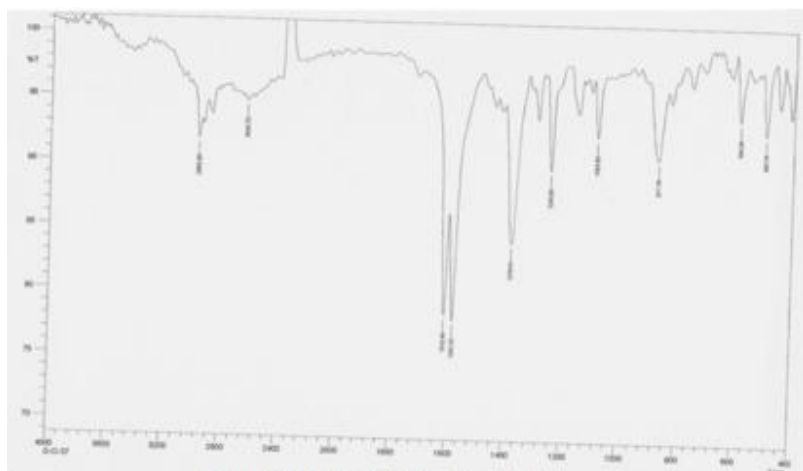


Fig.53: IR spectrum of Schiff base 20

The Mass spectrum (Fig.54) gave m/z 328.27 for $M^{+}+1$.

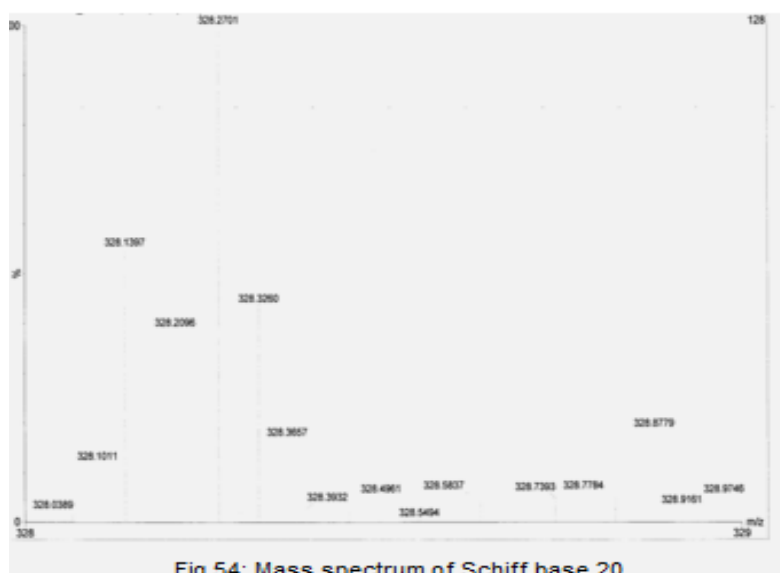


Fig.54: Mass spectrum of Schiff base 20

The ^1H NMR spectrum (Fig.55) revealed the following signals:

δ 1.05	triplet	14H
δ 2.19	triplet	6H
δ 3.12	singlet	3H
δ 7.23	singlet	5H

The triplet at δ 1.05(14H) was assigned for the four methyl groups and the methylene group neighbouring (C=N) in dimedone moiety ,while the signal at δ 2.19 (t,6H) corresponds to the two methylene groups of diethylamine moiety and other methylene group of dimedone moiety . The singlet at δ 3.12 (3H) was assigned for the methylene of the Mannich base side chain and a methine proton . The aromatic protons resonate as a singlet at δ 7.23(5H).

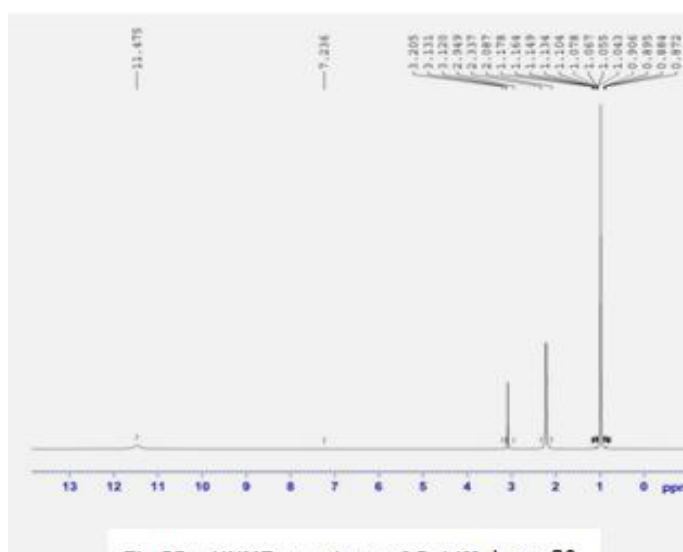
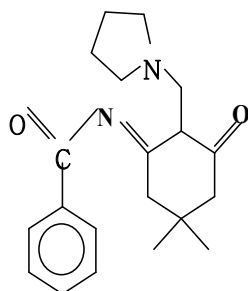


Fig.55: ^1H NMR spectrum of Schiff base 20

On the basis of its spectral data, this Schiff base was assigned structure (20) above.

3.21- Synthesis of the Schiff base: (E)-N-[5-dimethyl-3-oxo(pyrrolidin-1-methyl)cyclohexylidene]benzamide (21)

The Schiff base (21) was synthesized via the reaction of the Mannich base (3) with benzamide.



21

IR spectrum (Fig.56) showed $\nu(\text{KBr})$ 584, 871 (C-H, Ar. , bending), 1245(C-N), 1379 (C=C, Ar.), 1581(C=N), 1610(C=O) and 2964cm^{-1} (C-H,aliph.) .

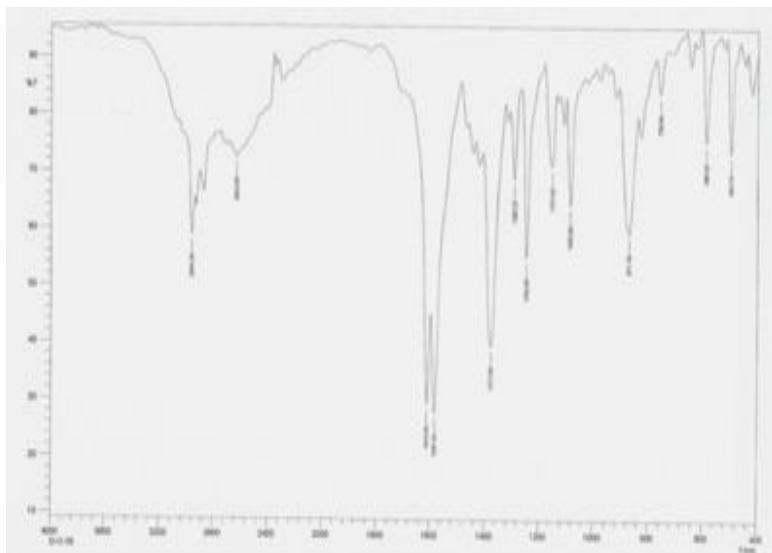


Fig.56: IR spectrum of Schiff base 21

The Mass spectrum (Fig.57) gave m/z 326.29 for $M^{+}+1$.

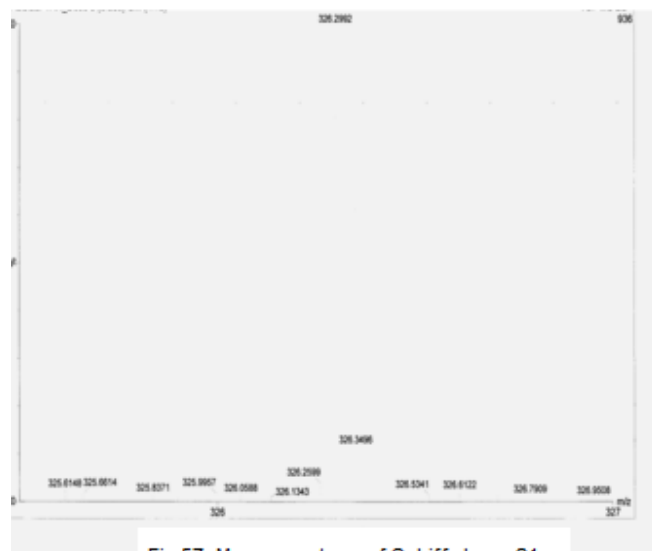
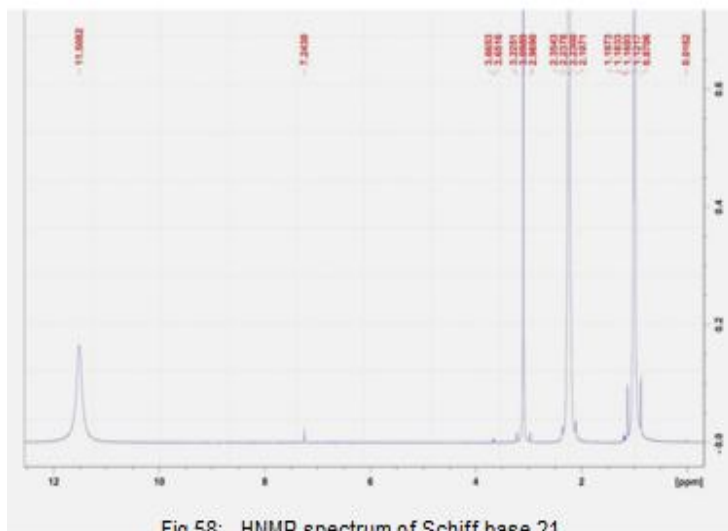


Fig.57: Mass spectrum of Schiff base 21

The ^1H NMR spectrum (Fig.58) revealed the following signals:

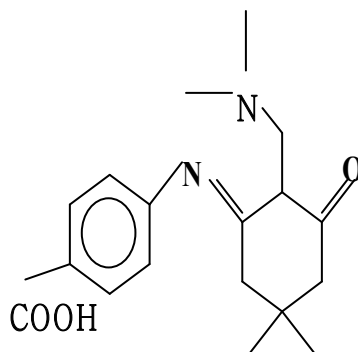
δ 0.87-1.19	multiplet	8H
δ 2.23	triplet	10H
δ 3.09	triplet	3H
δ 7.24	singlet	5H

The multiplet at δ 0.87-1.19 (8H) was assigned for two methyl groups (of dimedone moiety) and methylene group neighbouring (C=N) in dimedone ,while the signal at δ 2.23 (t,10H) corresponds to the five methylene groups (of dimedone and pyrrolydine moieties). The triplet at δ 3.09 (3H) was assigned for the methylene of the Mannich base side chain and a methine proton . The aromatic protons resonate as a singlet at δ 7.24(5H).



3.22- Synthesis of the Schiff base: (E)-4-[2-(dimethylaminomethyl)-5,5-dimethyl-3-oxocyclohexylideneamino]benzoic acid(22)

The Schiff base (22) was synthesized via the reaction of the Mannich base (1) with 4-aminobenzoic acid.



22

IR spectrum (Fig.59) showed $\nu(\text{KBr})$ 675, 750 (C-H, Ar. , bending), 1275(C-N), 1500,1510 (C=C, Ar.), 1600(C=N), 1660,1680(C=O) and 3500cm^{-1} (C-H,aliph.) .

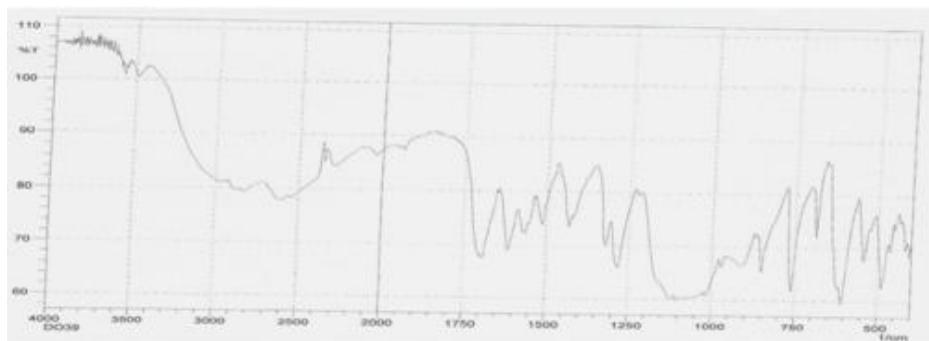


Fig.59: IR spectrum of Schiff base 22

The Mass spectrum (Fig.60) gave m/z 316.1 for $M^+ + 1$.

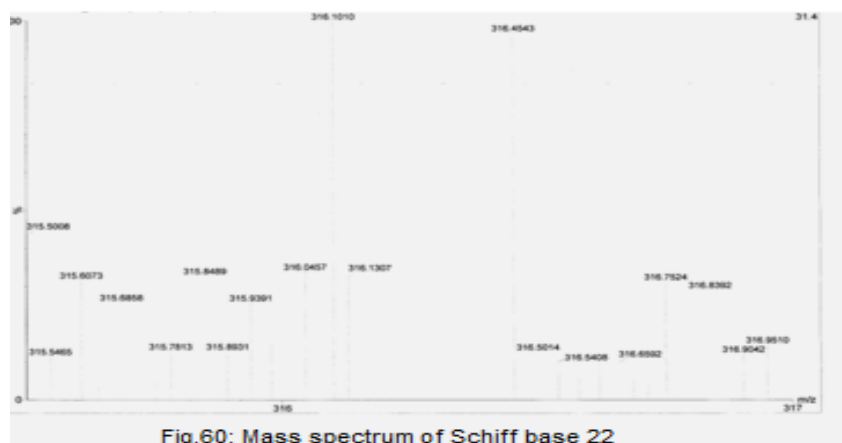


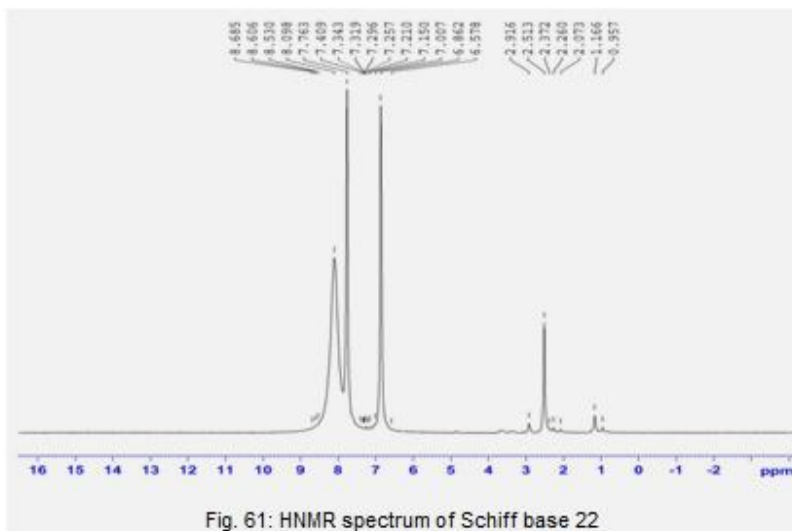
Fig.60: Mass spectrum of Schiff base 22

The $^1\text{H NMR}$ spectrum (Fig.61) revealed the following signals:

δ 0.95	singlet	6H
δ 1.16	singlet	2H
δ 2.37	singlet	8H
δ 2.91	singlet	3H
δ 6.86	singlet	2H
δ 7.92	doublet	2H

The signal at δ 0.95 (s,6H) was assigned for two methyl groups (of dimedone moiety) , while the signal at δ 1.16 (s,2H) corresponds to the methylene group neighbouring (C=N) in dimedone . The singlet at δ 2.37 (8H) was assigned for two methyl groups (N^{\leftarrow})

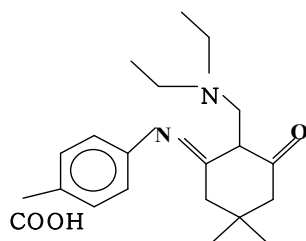
and methylene group of dimedone moiety. The signal at δ 2.91 (s,3H) was assigned for the methylene of the Mannich base side chain and a methine proton. The aromatic protons resonate as a singlet at δ 6.86 (2H) for the protons neighbouring of (C=O) and as a doublet at δ 7.92(3H) for the other protons.



On the basis of such spectral data, structure (22) above was suggested for this base.

3.23- Synthesis of the Schiff base: (E)-4-[2-(diethylaminomethyl)-5,5-dimethyl-3-oxocyclohexylideneamino]benzoic acid (23)

The Schiff base (23) was synthesized via the reaction of the Mannich base (2) with 4-aminobenzoic acid.



23

IR spectrum (Fig.62) showed $\nu(\text{KBr})$ 758, 827, 873 (C-H, Ar. , bending), 1085(C-N), 1419, 1448 (C=C, Ar.), 1579(C=N), 1610 (C=O) and 2918cm^{-1} (C-H, aliph.) .

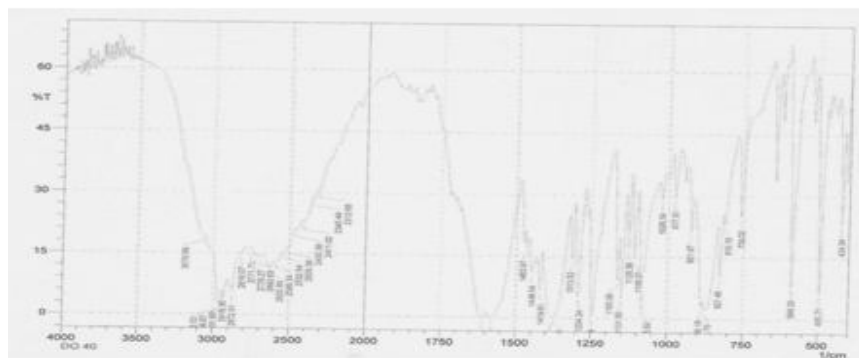


Fig.62: IR spectrum of Schiff base 23

The Mass spectrum (Fig.63) gave m/z 344.20 for $M^{+}+1$.

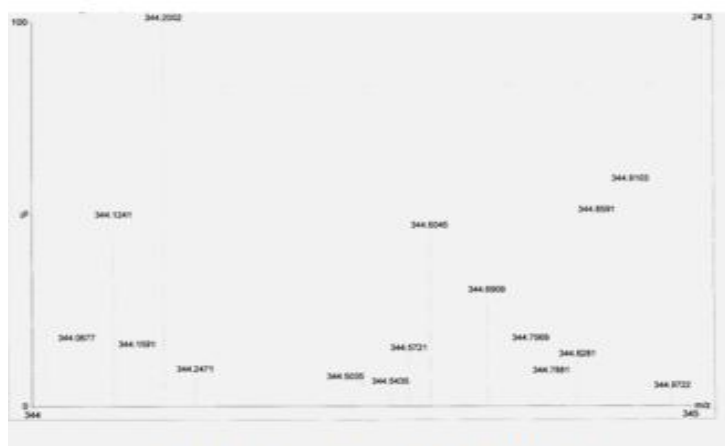


Fig. 63: Mass spectrum of Schiff base 23

The ^1H NMR spectrum (Fig.64) revealed the following signals:

δ 0.73-1.19	multiplet	14H
δ 1.96-2.34	multiplet	6H
δ 3.07	triplet	3H
δ 7.24	singlet	4H
δ 11.46	singlet	1H

The multiplet at $\delta 0.73-1.19$ (14H) was assigned for the four methyl groups (of dimedone and diethylamine moieties) and methylene group neighbouring (C=N) in dimedone . The signal at $\delta 1.96-2.34$ (m,6H) was assigned for the other methylene groups , while the triplet at $\delta 3.07$ (3H) corresponds to the methylene of the Mannich base side chain and a methine proton . The aromatic protons resonate as a singlet at $\delta 7.24$ (4H) , while the signal at $\delta 11.46$ (s,1H) corresponds to the carboxylic proton .

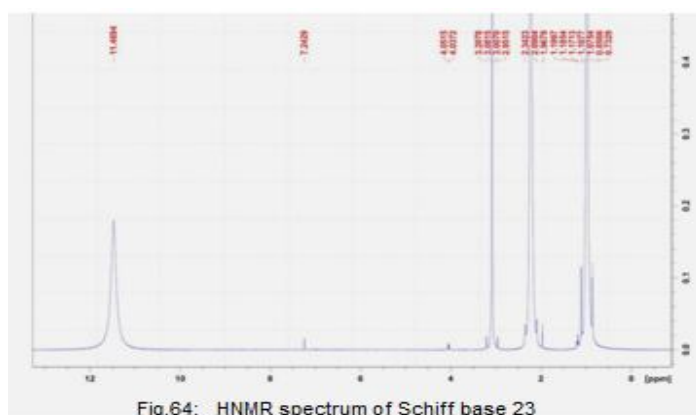
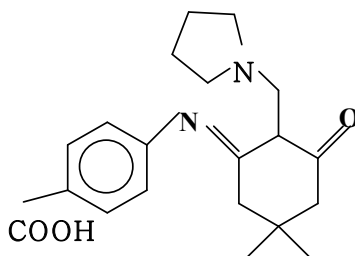


Fig.64: HNMR spectrum of Schiff base 23

On the basis of its spectral data , structure (23) was assigned for this Schiff base.

3.24- Synthesis of the Schiff base: (E)-4-[5,5-dimethyl-3-oxo-2-(pyrrolidin-1-ylmethyl)cyclohexylideneamino]benzoic acid (24)

The Schiff base (24) was synthesized via the reaction of the Mannich base (3) with 4-aminobenzoic acid .



24

IR spectrum (Fig.65) showed $\nu(\text{KBr})$ 590 ,871 (C-H, Ar. , bending),1085(C-N), 1419 (C=C, Ar.), 1575(C=N), 1585 (C=O) and 2966cm^{-1} (C-H,aliph.) .

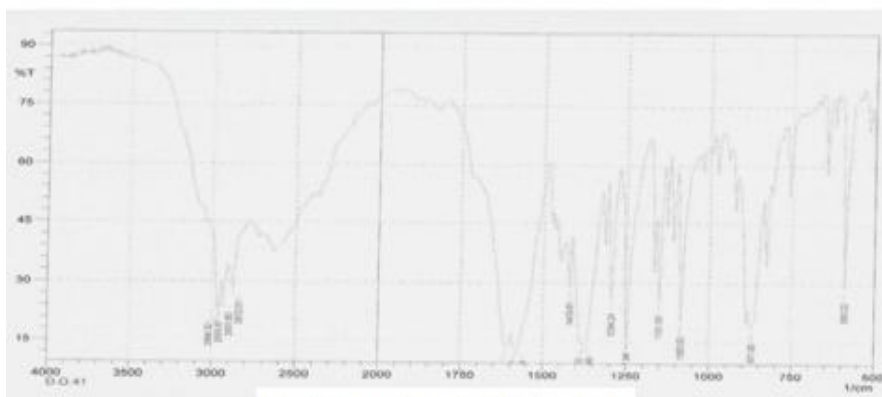


Fig.65: IR spectrum of Schiff base 24

The Mass spectrum (Fig.66) gave m/z 342.30 for $M^{+}+1$.

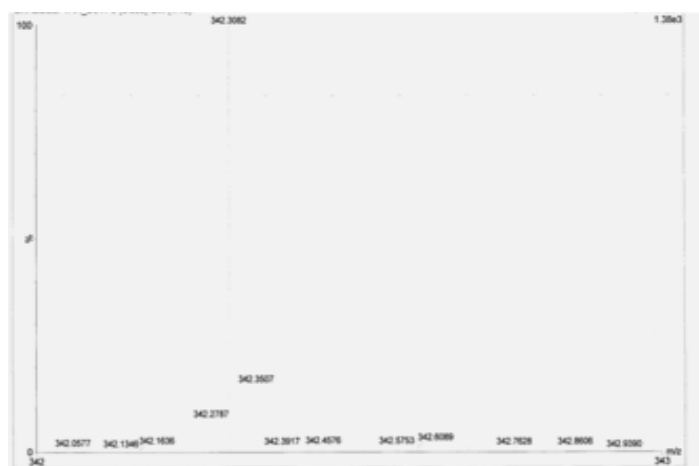
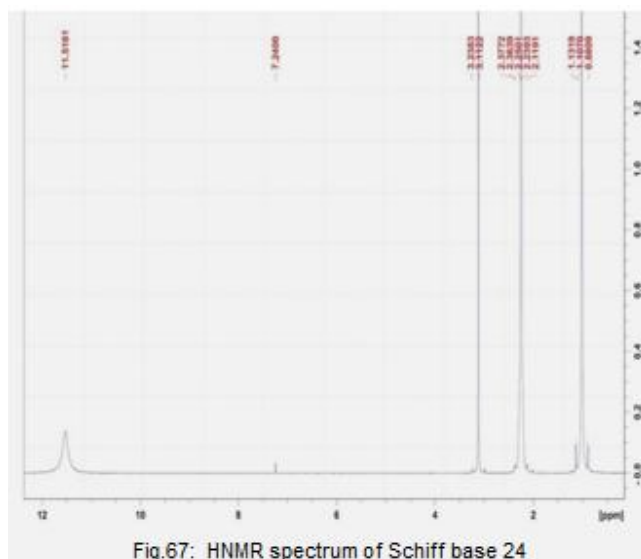


Fig.66: Mass spectrum of Schiff base 24

The ^1H NMR spectrum (Fig.67) revealed the following signals:

δ 1.1	singlet	12H
δ 2.25	singlet	6H
δ 3.11	singlet	3H
δ 7.24	singlet	4H
δ 11.46	singlet	1H

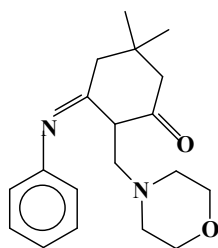
The singlet at $\delta 1.1$ (12H) was assigned for two methyl groups (of dimedone moiety) and three methylene groups (methylene group neighbouring (C=N) in dimedone and two methylene groups not neighbouring N atom in pyrrolidine), while the signal at $\delta 2.25$ (s,6H) corresponds to the other methylene groups (of dimedone and pyrrolidine moieties). The singlet at $\delta 3.11$ (3H) accounts for the methylene of the Mannich base side chain and a methine proton. The aromatic protons resonate as a singlet at $\delta 7.24$ (4H), while the signal at $\delta 11.46$ (s,1H) corresponds to the carboxylic proton.



On the basis of the above spectral data, structure (24) was assigned for this Schiff base.

3.25- Synthesis of the Schiff base: (Z)-5,5-dimethyl-2-(morpholinomethyl)-3-(phenylimino)cyclohexanone (25)

The Schiff base (25) was synthesized via the reaction of the Mannich base (4) with aniline.



25

IR spectrum (Fig.68) showed $\nu(\text{KBr})$, 690,750 (C-H, Ar., bending) ,1250 (CN) , 1375, 1400(C=C, Ar) ,1500 (C=N) , 1650 (C=O) and 2900 (C-H,aliphatic) .

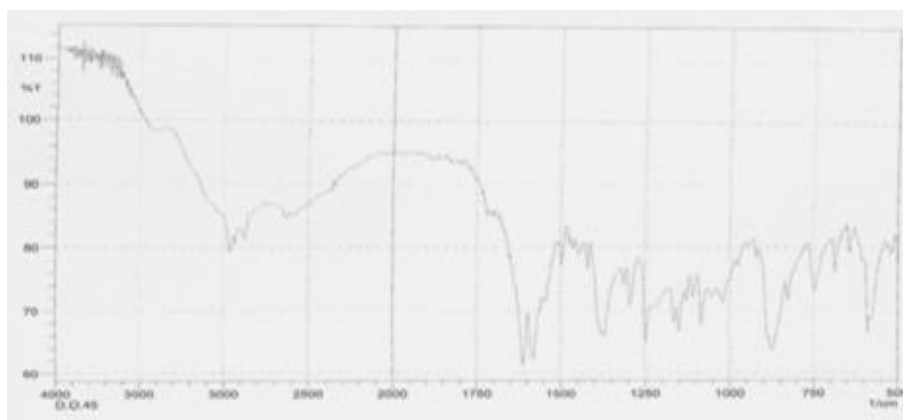


Fig.68: IR spectrum of Schiff base 25

The Mass spectrum (Fig.69) gave m/z 314.42 for $M^{+}+1$.

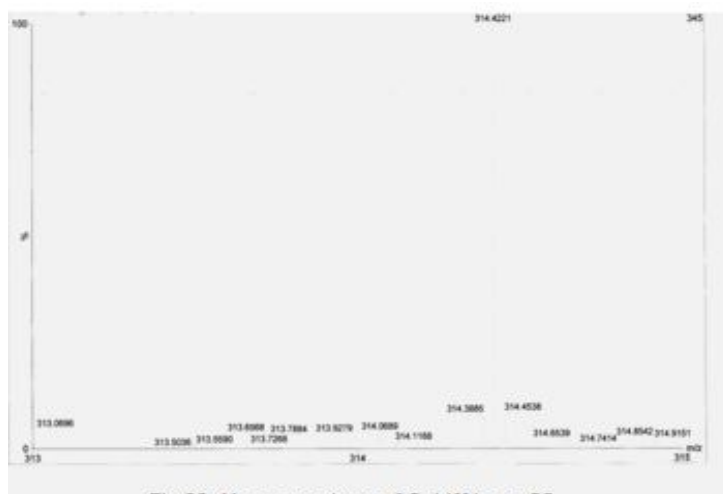


Fig.69: Mass spectrum of Schiff base 25

The ^1H NMR spectrum (Fig.70) revealed the following signals:

δ 0.95	singlet	8H
δ 2.25	singlet	2H
δ 2.49	singlet	7H
δ 3.04	singlet	4H
δ 7.23-7.27	multiplet	2H
δ 7.42	triplet	3H

The resonance at δ 0.95 (s,8H) was assigned for two methyl groups (of dimedone moiety) and methylene group neighbouring (C=N) in dimedone, while the signal at δ 2.25 (s,2H) corresponds to the other methylene group (of dimedone moieties). The signal at δ 2.49 (s,7H) was assigned for the two methylene groups neighbouring N (of morpholine moiety) and for the methylene of the Mannich base side chain and methine proton, while the singlet at δ 3.04 (4H) corresponds to the two methylene groups neighbouring of O (of morpholine moiety). The aromatic protons resonate as a multiplet at δ 7.23-7.27(2H) and as a triplet at δ 7.42 (3H).

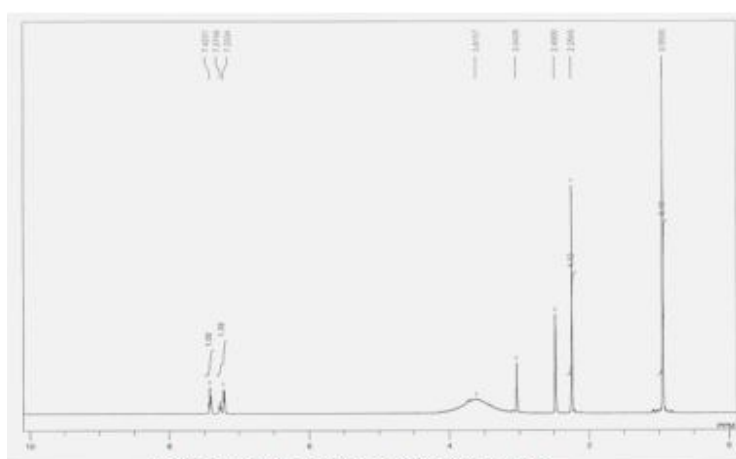
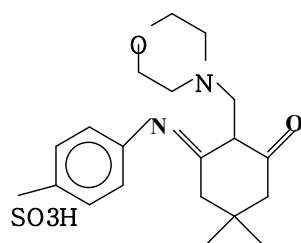


Fig.70: ^1H NMR spectrum of Schiff base 25

On the basis of its spectral data, structure (25) was proposed for this Schiff base.

3.26- Synthesis of the Schiff base: (E)-4-[5,5-dimethyl-2-(morpholinomethyl)]-3-(oxocyclohexylideneamino)benzene sulfonic acid (26)

The Schiff base (26) was synthesized via the reaction of the Mannich base (4) with sulfanilic acid.



26

IR spectrum (Fig.71) showed $\nu(\text{KBr})$, 850,880 , (C-H, Ar., bending) , 1010 (SO_3H , Ar.) , 1070 (C-O) , 1170 (CN) , 1350(C=C, Ar) ,1580 (C=N) , 1610 (C=O) and 2980 (C-H,aliph.) .

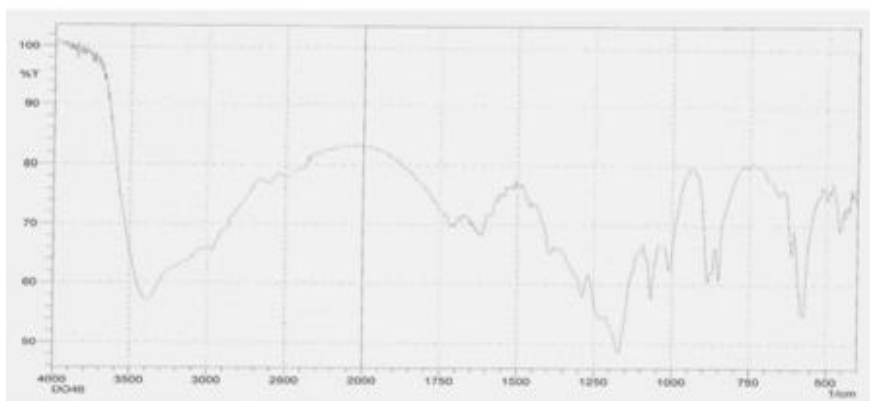
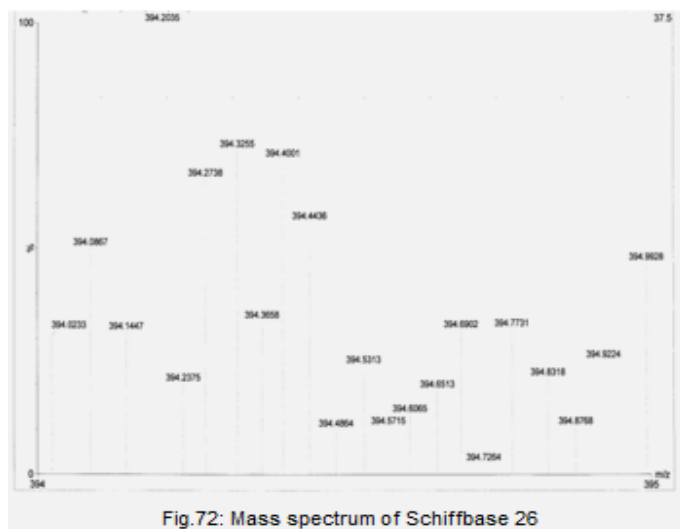


Fig.71: IR spectrum of Schiff base 26

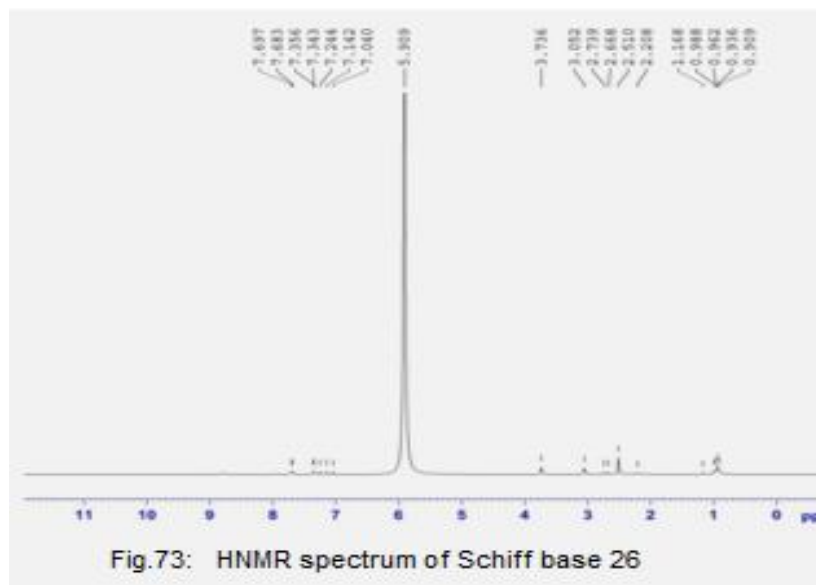
The Mass spectrum (Fig.72) gave m/z 394.20 for $\text{M}^+ + 1$.



The ^1H NMR spectrum (Fig.73) revealed the following signals:

δ 0.90-1.16	multiplet	8H
δ 2.51-2.71	multiplet	8H
δ 3.05	singlet	2H
δ 3.73	singlet	4H
δ 7.04-7.69	multiplet	4H

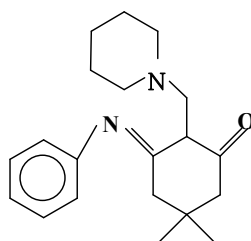
The multiplet at δ 0.90-1.16 (8H) was assigned for two methyl groups (of dimedone moiety) and methylene group neighbouring (C=N) in dimedone , while the multiplet at δ 2.51-2.71 (8H) corresponds to the other methylene group of dimedone moiety , two methylene groups neighbouring N (morpholine moiety) , sulphonic acid group and a methine proton . The signal at δ 3.05 (s,2H) was assigned for the methylene of the Mannich base side chain , while the singlet at δ 3.73 (4H) accounts for the two methylene groups neighbouring O (of morpholine moiety). The aromatic protons resonate as a multiplet at δ 7.04-7.69 (4H).



On the basis of its spectral data , structure (26) was suggested for this Schiff base.

3.27- Synthesis of the Schiff base: (E)-5,5-dimethyl-3-(phenylimino)-2-(piperidin-1-ylmethyl)cyclohexanone (27)

The Schiff base (27) was synthesized via the reaction of the Mannich (5) with aniline.



27

IR spectrum (Fig.74) showed $\nu(\text{KBr})$, 840,875 (C-H, Ar., bending) ,1085 (CN) , 1369, 1379(C=C, Ar) ,1581 (C=N) , 1610 (C=O) and 2931,2964 (C-H,aliph.) .

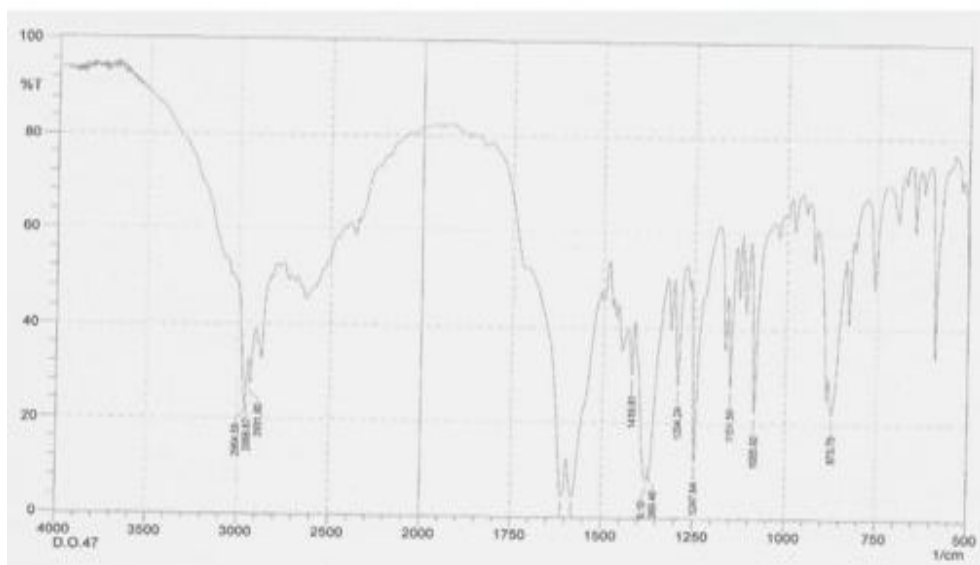


Fig.74: IR spectrum of Schiff base 27

The Mass spectrum (Fig.75) gave m/z 312.55 for $M^{+}+1$.

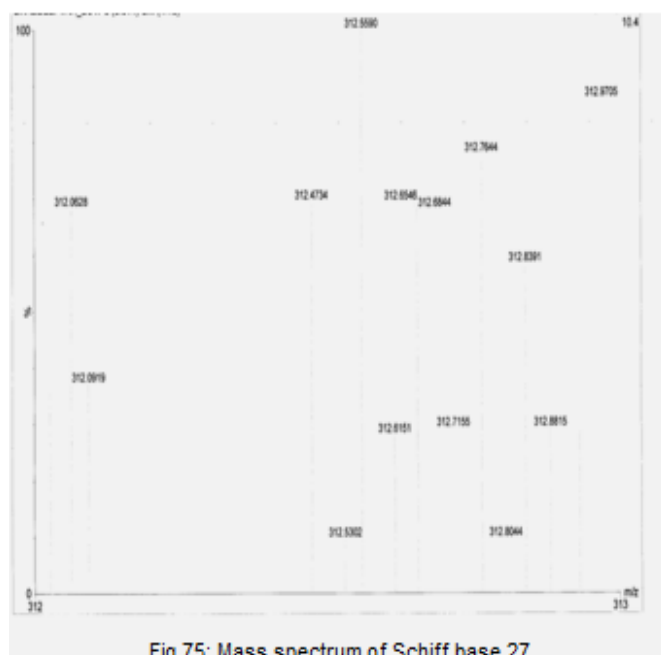
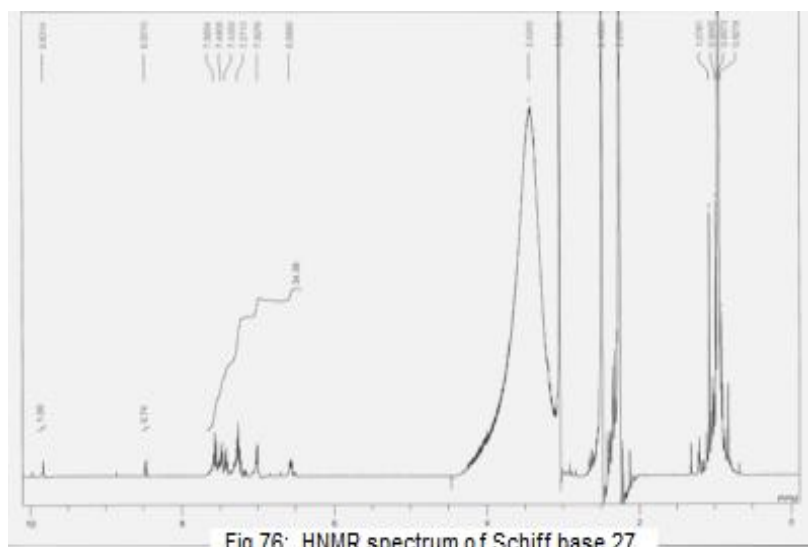


Fig.75: Mass spectrum of Schiff base 27

The ^1H NMR spectrum (Fig.76) revealed the following signals:

δ 0.90-1.07	multiplet	8H
δ 2.28-2.49	multiplet	12H
δ 3.04-3.43	multiplet	3H
δ 7.0	singlet	2H
δ 7.27-7.58	multiplet	3H

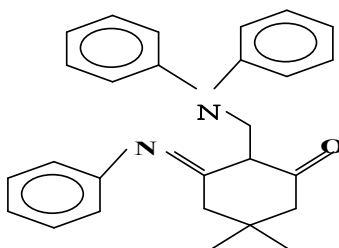
The multiplet at δ 0.90-1.07 (8H) was assigned for two methyl groups (of dimedone moiety) and methylene group neighbouring (C=N) in dimedone, while the signal at δ 2.28-2.49 (m,12H) corresponds to the six methylene groups (dimedone and piperidine moieties). The multiplet at δ 3.04-3.43 (3H) was assigned for the methylene of the Mannich base side chain and a methine proton. The aromatic protons resonate as a singlet at δ 7.0 (2H) for protons neighbouring of N=C and a multiplet at δ 7.27-7.58 (3H) for the other protons.



On the basis of the above data, structure (27) was assigned for this Schiff base.

3.28- Synthesis of Schiff base: (E)-2-(diphenylaminomethyl)-5,5-dimethyl-3-(phenylimino)cyclohexanone(28)

The Schiff base (28) was synthesized via the reaction of the Mannich base (6) with aniline.



28

IR spectrum (Fig.77) showed $\nu(\text{KBr})$, 640,750 (C-H, Ar., bending) ,1310 (CN) , 1500 (C=C, Ar) ,1520 (C=N) , 1590 (C=O) and 2920 (C-H,aliph.) .

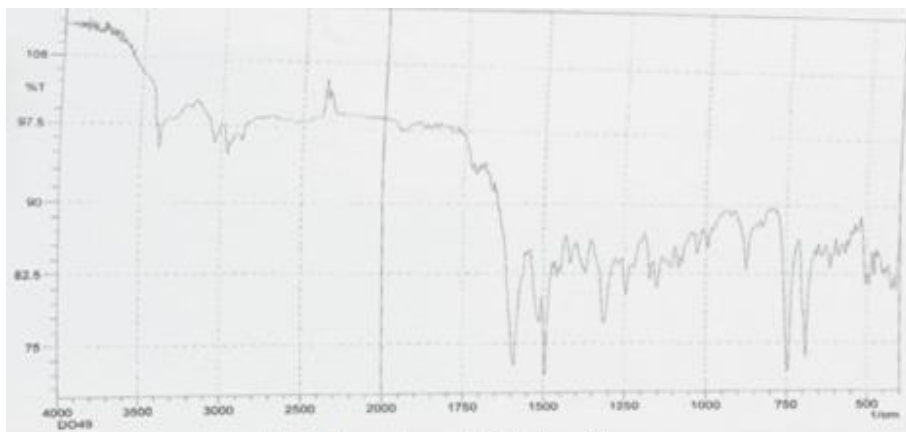


Fig.77: IR spectrum of Schiff base 28

The Mass spectrum (Fig.78) gave m/z 396.08 for $M^{+}+1$.

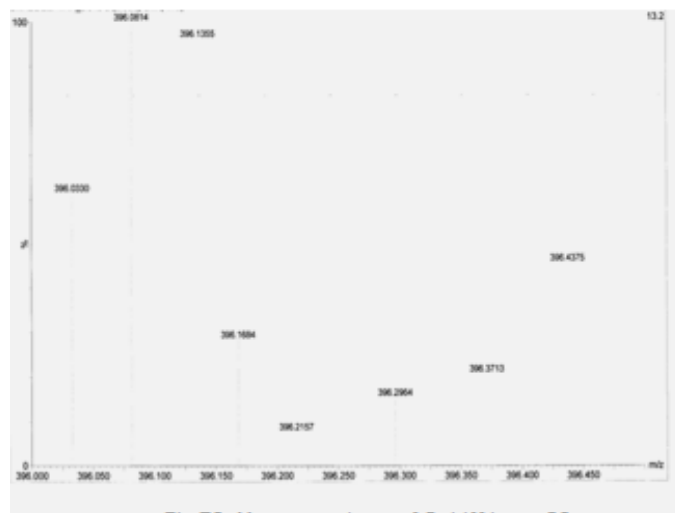


Fig.78: Mass spectrum of Schiff base 28

The ^1H NMR spectrum (Fig.79) revealed the following signals:

δ 0.95-1.01	multiplet	8H
δ 2.04	singlet	2H
δ 2.49	singlet	1H
δ 3.38	singlet	2H
δ 6.79	triplet	2H
δ 7.05	doublet	3H
δ 7.20	triplet	10H

The multiplet at δ 0.95-1.01 (8H) was assigned for two methyl groups (of dimedone moiety) and methylene group neighbouring (C=N) in dimedone , while the signal at δ 2.04 (s, 2H) corresponds to the other methylene group of dimedone moiety. The singlet at δ 2.49 (1H) was assigned for a methine proton , while the signal at δ 3.38 (s, 2H) corresponds to the methylene of the Mannich base side chain. The aromatic protons resonate as a triplet at δ 6.79(2H) , a doublet at δ 7.05 (3H) and a triplet at δ 7.20 (10H) .

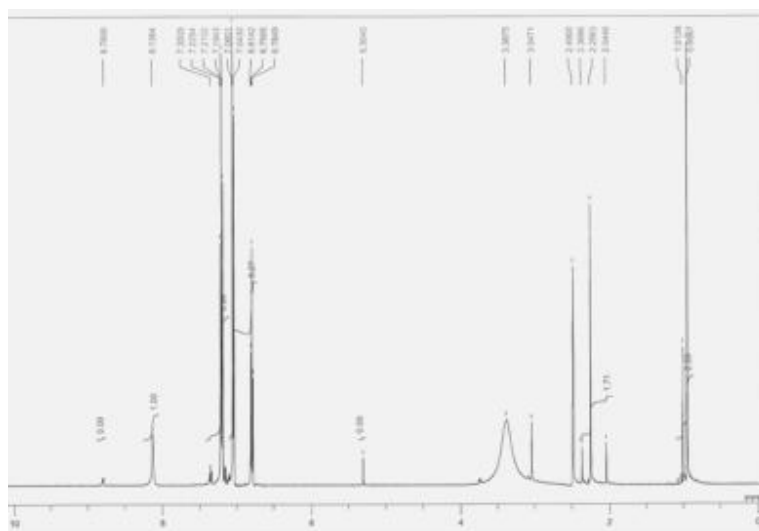
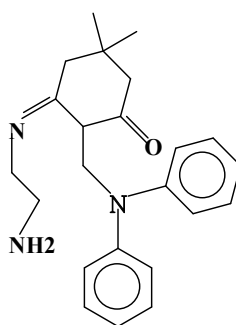


Fig.79: ¹H NMR spectrum of Schiff base 28

On the basis of its spectral data, this Schiff base was assigned structure (28) above.

3.29- Synthesis of Schiff base: (Z)-3-[(2-aminomethylimino)-2-(diphenylaminomethyl)]cyclohexanone(29)

The Schiff base (29) was synthesized via the reaction of the Mannich base (6) with ethylenediamine.



29

IR spectrum (Fig.80) showed $\nu(\text{KBr})$, 700,750,850(C-H, Ar., bending) ,1125 (CN) , 1450, 1500(C=C, Ar) ,1510 (C=N) , 1650 (C=O) , 3050 (C-H,aliph.) and 3400(N-H) .

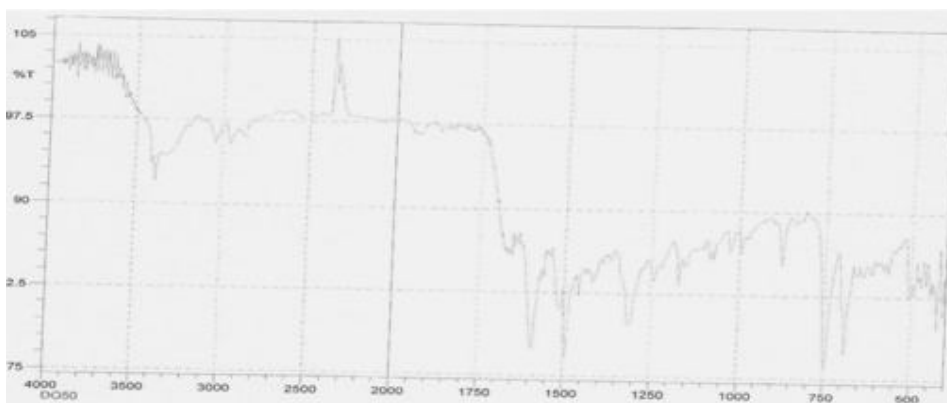


Fig.80: IR spectrum of Schiff base 29

The Mass spectrum (Fig.81) gave m/z 363.39 for $M^{+}+1$.

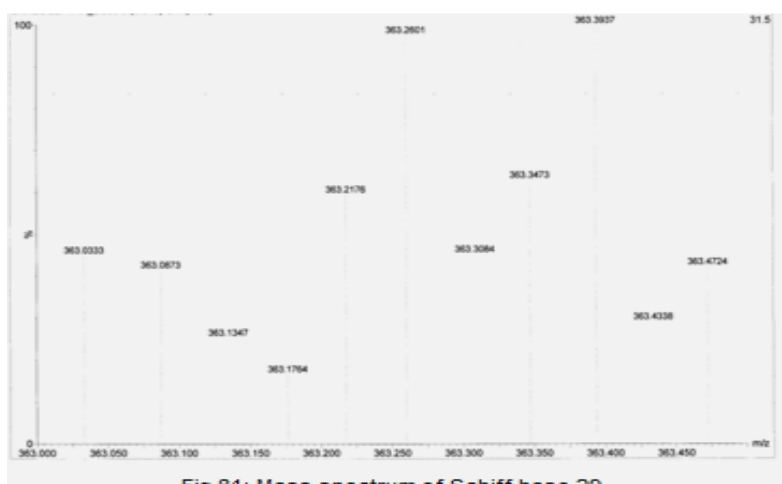


Fig.81: Mass spectrum of Schiff base 29

The ^1H NMR spectrum (Fig.82) revealed the following signals:

δ 0.93-0.94	multiplet	8H
δ 2.09-2.16	multiplet	6H
δ 2.48	singlet	3H
δ 3.38	singlet	2H
δ 6.79	triplet	2H
δ 7.04	doublet	4H
δ 7.20	triplet	4H

The signal at $\delta 0.94-0.93$ (m, 8H) was assigned for two methyl groups and methylene group neighbouring (C=N) in dimedone . The multiplet at $\delta 2.09 - 2.16$ (6H) was assigned for two methylene groups and one amino group (-CH₂-CH₂-NH₂). The signal at $\delta 2.48$ (s, 3H) was assigned for the other methylene group (of dimedone moiety) and a methine proton, while the singlet at $\delta 3.38$ (2H) corresponds to the methylene of the Mannich base side chain. The aromatic protons appear as triplet at $\delta 6.79$ (2H) , doublet at $\delta 7.04$ (d, 4H) and triplet at $\delta 7.20$ (4H).

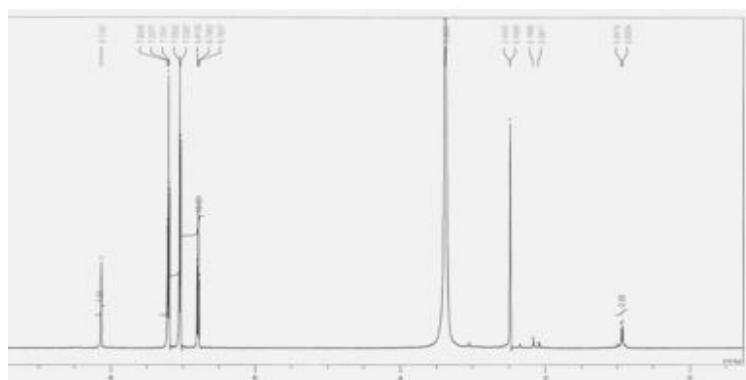
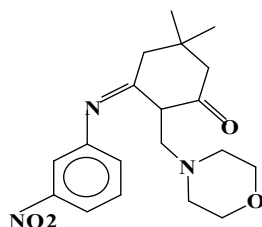


Fig.82: HNMR spectrum of Schiff base 29

On the basis of the above spectral data , structure (29) above was assigned for this Schiff base.

3.30- Synthesis of Schiff base: (Z)-5,5-dimethyl-2-(morpholinomethyl)-3-(3-nitrophenylimino)cyclohexanone (30)

The Schiff base (30) was synthesized via the reaction of the Mannich base (4) with 3-nitroaniline.



30

IR spectrum(Fig.83) showed $\nu(\text{KBr})$, 700,740 (C-H, Ar., bending) ,1225 (CN) , 1300, 1350,1400 (C=C, Ar) ,1540 (C=N) , 1575 (C=O) and 3025 (C-H,aliph.) .

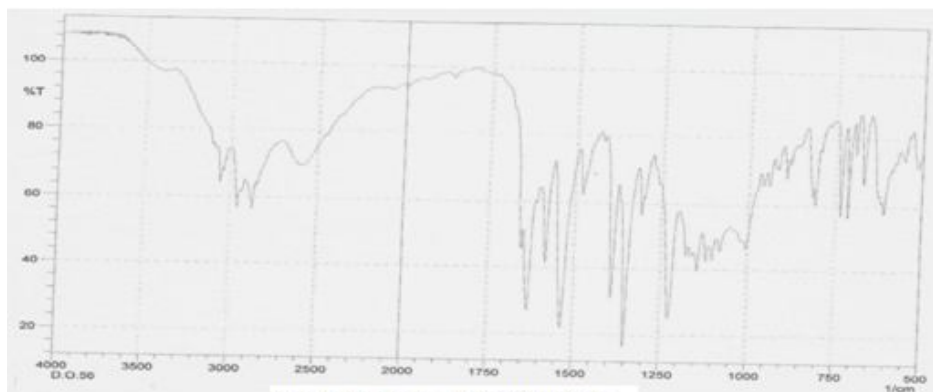


Fig.83: IR spectrum of Schiff base 30

The Mass spectrum(Fig.84) gave m/z 359.43 for $M^{+}+1$.

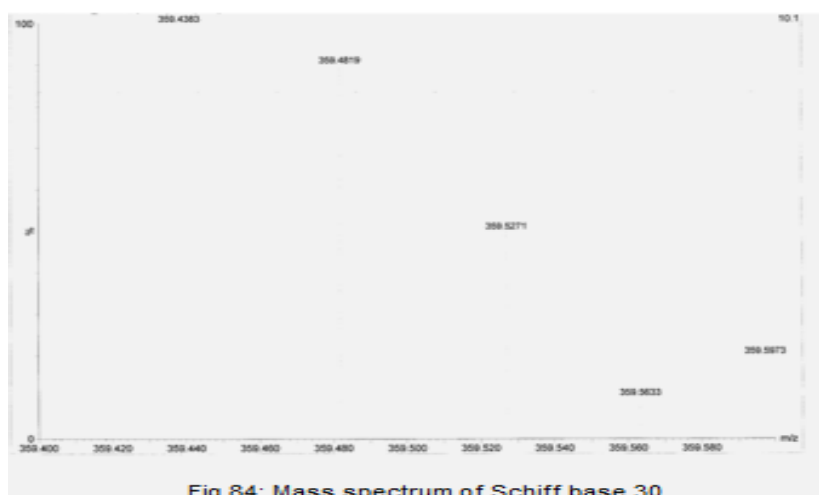
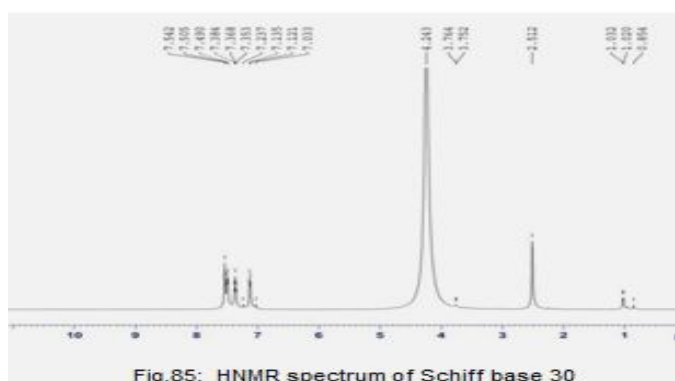


Fig.84: Mass spectrum of Schiff base 30

The ^1H NMR spectrum(Fig.85) revealed the following signals:

δ 0.85	singlet	6H
δ 1.02	singlet	2H
δ 2.51-	singlet	9H
δ 4.2	singlet	4H
δ 7.03-7.5	multiplet	4H

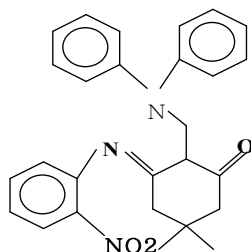
The signal at $\delta 0.85$ (s,6H) was assigned for two methyl groups, while the singlet at $\delta 1.02$ (2H) corresponds to a methylene group neighbouring (C=N) in dimedone. The resonance at $\delta 2.51$ (s,9H) corresponds to four methylene groups (other methylene group of dimedone moiety, 2 methylene groups neighbouring of N in morpholine and methylene of the Mannich side chain) and one methine proton, while the singlet at $\delta 4.2$ (4H) was assigned for the other 2 methylene groups of morpholine moiety (neighbouring of O). The aromatic protons appear as multiplet at $\delta 7.03-7.5$ (4H).



On the basis of the above spectral data, structure (30) was proposed for this Schiff base.

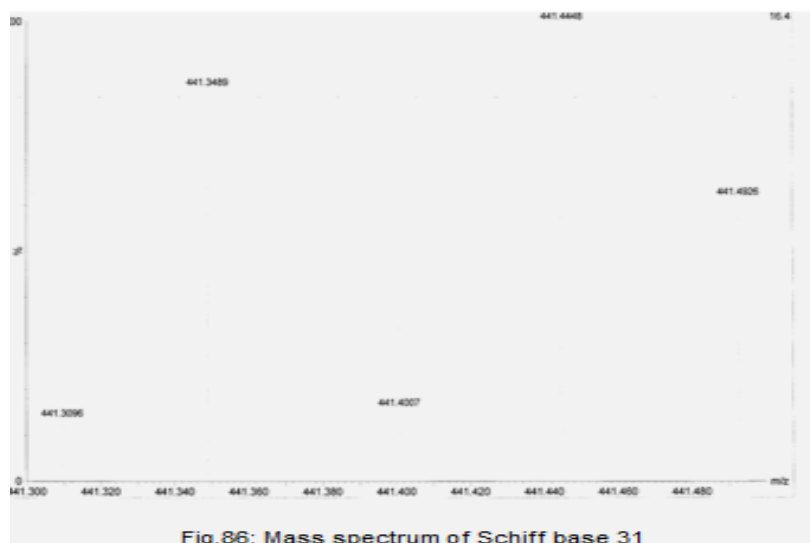
3.31- Synthesis of the Schiff base: (Z)-2-(diphenylaminomethyl)-5,5-dimethyl-3-(3-nitrophenylimino)cyclohexanone(31)

The Schiff base (31) was synthesized via the reaction of the Mannich base (6) with 3-nitroaniline.



31

The Mass spectrum (fig.86) gave m/z 441.34 for M⁺⁺1.

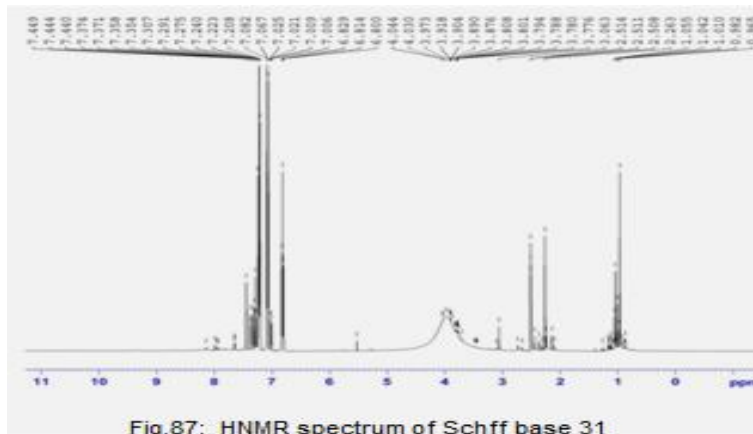


The ¹HNMR spectrum (Fig.87) revealed the following signals:

δ0.96-1.05	multiplet	8H
δ2.26-2.5	multiplet	3H
δ3.06	singlet	2H
δ 6.80	triplet	5H
δ7.07	doublet	1H
δ7.22	triplet	4H
δ7.29	triplet	4H

The multiplet at δ0.96-1.05 (8H) was assigned for the two methyl groups and methylene group neighbouring (C=N) of dimedone moiety, while the multiplet at δ2.26-2.5 (3H) was assigned for the other methylene group of dimedone moiety and a methine proton. The singlet at δ3.06 (2H) corresponds to the methylene of the Mannich base side chain. The aromatic protons resonate as a triplet

at δ 6.80 (5H) , a doublet at δ 7.07 (1H) and triplets at δ 7.22 (4H) and δ 7.29(4H) .



On the basis of the above data, structure (31) above was assigned for this Schiff base.

3.32 Antimicrobial activity

The targeted series of ketonic and phenolic Mannich adducts were evaluated for their antimicrobial potential against six standard organisms: *Bacillus subtilus* (B.S) *Staphylococcus aureus* (S.a.), *Escherichia coli* (E.c.), *Pseudomonas aeruginosa* (P.s.), *Aspergillus Niger*(A.n.) and *Candida albicans*.(C.a)- table (3.1).

Table 3.1 : Test organisms

Ser. No	Micro organism	Type	Source
1	<i>Bacillus subtilus</i>	G+ve	NCTC 2836
2	<i>Staphylococcus aureus</i>	G+ve	ATCC 29213
3	<i>Pseudomonas aeruginosa</i>	G-ve	ATCC 27853

4	<i>Escherichia coli</i>	G-ve	ATCC 25922
5	<i>Aspergillus Niger</i>	fungi	ATCC 9736
6	<i>Candida albicans</i>	fungi	ATCC 7596

* NCTC. National collection of type culture, Colindale. England

** ATCC. American type culture collection, Maryland, USA

Table 3.2: Antimicrobial activity of synthesized compounds

Sample	Inhibition growth zone diameter at 100mg/100ml					
	I	II	III	IV	V	VI
Compound1	-	-	-	-	-	-
Compound2	-	-	-	-	-	-
Compound3	11	20	-	-	11	12
Compound4	-	-	-	-	-	-
Compound5	-	11	11	11	15	-
Compound6	-	-	-	-	-	-
Compound7	-	15	12	14	14	12
Compound8	14	11	-	13	-	-
Compound9	28	26	30	29	30	36
Compound10	26	26	24	30	18	15
Compound11	13	16	14	15	23	27

Compound12	14	17	16	16	18	14
Compound13	20	20	21	22	31	30
Compound14	20	29	18	21	26	27
Compound15	30	34	30	32	27	36
Compound16	12	17	13	15	13	14
Compound17	-	-	-	-	-	-
Compound18	-	-	-	-	-	-
Compound19	-	-	-	-	-	-
Compound20	-	12	-	-	11	14
Compound21	11	11	-	-	12	-
Compound22	14	15	14	13	15	-
Compound23	-	-	-	-	-	-
Compound24	-	11	-	-	11	11
Compound25	15	20	19	21	-	26
Compound26	-	-	-	-	-	-
Compound27	-	-	-	-	-	-
Compound28	-	-	-	-	-	-
Compound29	19	24	14	19	27	21
Compound30	15	15	15	15	26	24
Compound31	26	18	22	21	25	25

I= Escherichia coli

II= Pseudomonas aeruginosa

III= Bacillus subtilis

IV= Staphylococcus aureus

V= Candida albicans

VI= Aspergillus Niger

Compounds 9,10,13,14,15,25,29 and 31 showed significant antimicrobial activity. However, compounds 11 and 30 showed significant antifungal activity . Compounds 12 and 22 showed moderate antimicrobial activity, but compounds 3,7 and 16 exhibited only antibacterial activity . However, compound 5 exhibited only antifungal activity. Compounds 1,2,4,6,8,17,18,19,20,21,23,24,26,27 and 28 did not show any antimicrobial activity(Table 3.2).

Conclusion

Fifteen Mannich bases and sixteen Schiff bases were synthesized via a general synthesis protocol . The structure of the intermediates and targeted molecules was elucidated by a combination of spectral techniques (IR, ¹NMR , MS).

The targeted molecules were evaluated for antibacterial and antifungal . Compounds 9,10,13,14,15,25,29 and 31 showed significant antimicrobial activity. However, compounds 11 and 30 showed significant antifungal activity . Compounds 12 and 22 showed moderate antimicrobial activity, but compounds 3,7 and 16 exhibited only antibacterial activity . However, compound 5 exhibited only antifungal activity. Compounds 1,2,4,6,8,17,18,19,20,21,23,24,26,27 and 28 did not show any antimicrobial activity.

Recommendations

- 1- The active hydrogen components used in this study may be condensed with other primary and secondary amines to synthesize a series of Mannich bases.
- 2- The synthesized compounds may be evaluated for their anti-inflammatory, antimalarial, antitumour, antileishmenial and antispasmodic activity.
- 3- Structure- activity correlation studies on the targeted molecules are highly recommended.