Egypt. J. Chem. **Vol. 66,** No. 6 pp. 225 - 234 (2023)

Egyptian Journal of Chemistry

http://ejchem.journals.ekb.eg/

Studies on Synthesis, Characterization and Biological Activities of Novel Schiff Bases from amino acridone

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Abstract

Ullmann reaction was used to synthesis the N-anthranilic acid by reaction of o-chloro benzoic acid derivatives with o- and p-phenylene diamine, then the compounds were cyclized to amino acridone derivatives using poly(phosphoric acid) (PPA). Terphthaldehyde mono Schiff bases were synthesized by reaction 1:1mole of one of the following (o-,m-,p-toluidine and p-anisidine) with Terphthaldehyde. Extra Schiff bases were synthesized by reaction of previous prepared amino acridone derivatives with mono Schiff bases of Terphthaldehyde . In addition, other compounds were synthesized by reaction of aforesaid amino acridone derivatives each with 1 mole of Terphthaldehyde, 4-(dimethyl amino)benzaldehyde, 2-formyl benzoic acid and methyl-4-formyl benzoate. All synthesized compounds were characterized by FTIR, ^{1}H NMR and ^{13}C NMR spectroscopy. Some of the new synthesized products were examin their antibacterial activities against [*Escherichia coli* , *Klepsiella pneumoniae ,Staphlococcus aurous, Pseudomonas aeroginosa]* .

Keywords: Ullmann reaction; amino acridone derivatives ; Schiff bases; terphthaldehyde;; N-anthanilic acid; biological activities

1. Introduction

Heterocyclic chemistry become an important field among the chemistry field with a high place and history in society and brilliant future . Generally, acridone derivatives give a lot natural products and pharmaceutical agents that shows broad biological activities. Moreover , acridones are heterocyclic compounds have a tricyclic ring with nitrogen atom at position 10th and keto group at position 9th and are well known and important compounds . Mostly , many acridone derivatives have shown considerable biological activities which motivated research work a lot in this field [1]. Acridone derivatives have several distict effects, like immunosuppressive activity [2], antibacterial [3,4] antimalarial [5,6], antifungal [7], antitumor [8] , antiviral [9], antileshmanial [10], anticancer [11,12] and anticonvulsant activities [13] .

2. Experimental

All the used chemicals were of analytical grade reagents and received from BDH, UK and Fluka , Swiss. Thin layer chromatography (TLC) technique was used for testing the purity of synthesized derivatives beside the intermediate material. Silica gel type (60-100 mesh), the elute solvent used was a mixture (9.5:0.5) of chloroform: methanol . The iodine vapour was used for show spots. Electro thermal IA 9000 Digital – series melting point(1998) was used for reading melting points of prepared compounds. Shimadzu FT-IR-8400S was used for FTIR Spectroscopy analysis. Bruker BioSpin GmbH 400MHz instrument was used for ^{1}H NMR and C13NMR spectra using deuterated DMSO as solvent.

2.1 Preparation of N-Aryl anthranilic acids (3-6):

General procedure [14,15]

Using 0.042 mol of *o*-chlorobenzoic acid and mixed in (1000) ml three necked with condenser. Similarly , 0.042 mol of 2-chloro-5-nitro aniline, 0.04 mol of potassium carbonate (anhydrous) , 0.08 mol ortho or para pheneylene diamine and 0.2 g of cupric oxide . DMSO (10 drops) were added and

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Receive Date: 10 August 2022, Revise Date: 28 August 2022, Accept Date: 05 September 2022
DOI: 10.21608/EJCHEM.2022.155588.6713

the mixture was heated in oil bath at 121-132^{0}C for 6.0hrs. Distillation was used for removed of unreacted aniline compound and then added 0.5g of active charcoal to the hot distillate. Boiling the mixture for 10 min, filtered with vacuum, neutralize the filtrate using (1/1) [H_2O / CH_3COOH] . Then the product was filtered by vacuum and dried by air. Ethanol solvent was used for crystallization of product to give N-aryl anthranilic acid (3-6) pure materials. The physical data of the compounds (3-6) are listed in Table (1).

2.2 Preparation of the acridin – 9 (10H) - one compounds (7-10).

General method [15,16,17]

2g of aforesaid compounds (3-6)(Table 1) was individually heated with 20 ml of [poly (phosphoric acid)] in oil bath at 121-132^{0}C until produce homogenous solution . After 3hrs. ofreflux the solution , the product was precipitated y the addition of cold tap water and change the PH of solution to basic by adding ammonia solution . The precipitate was filtered by vacuum filtration and then washed many times with tap H_2O , and dried under lab. Condition. The product was crystallized by CH_3COOH .The Table (2) has shown the physical information for compounds (7-10) **.**

2.3 Preparations of mono Schiff base of Terphthaldehyde compounds (11-14).

The compounds:

11 = 4-((o-tolylimino)methyl)benzaldehyde
12 = 4-((m-tolylimino)methyl)benzaldehyde
13 = 4-((p-tolylimino)methyl)benzaldehyde
14 = 4-((4-methoxy phenylimino) methyl) benzaldehyde

General method [18]

A mixture of 0.003 mol of one of orth- or meta- or p-toluidine or p-anisidine mixed with 0.003 mol Terphthaldehyde and dissolved in 20ml methanol .Then the mixture was heated by reflux for 2hrs. , and checked by thin layer chromatography , then followed the solution with cooling and the precipitate has been filtered , dried and crystallized by methanol . The physical date are shows for compounds (11-14) in Table (3) .

2.4 Preparation of (E)-2 or 4-(4-((sub-phenylimino)methyl) benzylideneamino)acridin-9(10H)-one derivatives (15-30).

The compounds :

15 = 4-(4-((o-tolylimino)methyl) benzylideneamino) acridin -9(10H) –one
16 = 2-(4-((o-tolylimino)methyl) benzylideneamino) acridin -9(10H) –one
17 = 4-(4-((o-tolylimino)methyl) benzylideneamino) -7-nitroacridin -9(10H) –one
18 = 2-(4-((o-tolylimino)methyl) benzylideneamino) -7-nitroacridin -9(10H) –one
19 = 4-(4-((m-tolylimino)methyl) benzylideneamino) acridin -9(10H) –one
20 = 2-(4-((m-tolylimino)methyl) benzylideneamino) acridin -9(10H) –one
21 = 4-(4-((m-tolylimino)methyl) benzylideneamino) -7-nitro acridin -9(10H) –one
22 =2-(4-((m-tolylimino)methyl) benzylideneamino) -7-nitro acridin -9(10H) –one
23 = 4-(4-((P-tolylimino)methyl) benzylideneamino) acridin -9(10H) –one
24 = 2-(4-((P-tolylimino)methyl) benzylideneamino) acridin -9(10H) –one
25 =4-(4-((P-tolylimino)methyl) benzylideneamino) -7-nitro acridin -9(10H) –one
26 = 2-(4-((P-tolylimino)methyl) benzylideneamino) -7-nitro acridin -9(10H) –one
27 = 4-(4-((4-methoxyphenylimino)methyl) benzylideneamino) acridin -9(10H) –one
28 =2-(4-((4-methoxyphenylimino)methyl) benzylideneamino) acridin -9(10H) –one
29 = 4-(4-((4-methoxyphenylimino)methyl) benzylideneamino) -7-nitro acridin -9(10H) –one
30 = 2-(4-((4-methoxyphenylimino)methyl) benzylideneamino) -7-nitro acridin -9(10H) –one

General method [19,20]

The compounds:

11 = 4-((o-tolylimino)methyl)benzaldehyde
12 = 4-((m-tolylimino)methyl)benzaldehyde
13 = 4-((p-tolylimino)methyl)benzaldehyde
14 = 4-((4-methoxy phenylimino) methyl) benzaldehyde each with 0.0004 mol was mixed with 0.0004 mol of each and all of the following (7,8,9 and 10) compounds (Table 2) .finally sixteen solutions were refluxed for 5-8hrs. and each reaction was checked using [TLC] technique .The solutions were cooled and the produce precipate was filtered by vacuum and dried in air and finally crystallized by ethanol . The physical data of the synthesized compounds were listed in Table (4) .

2.5 Preparation of derivative compounds (31-46).

The compounds :

31=4-((9-oxo-9,10-dihydroacridin-4-ylimino)methyl)benzaldehyde

32=4-((9-oxo-9,10-dihydroacridin-2-ylimino)methyl)benzaldehyde

33=4-((7-nitro-9-oxo-9,10-dihydroacridin-4-ylimino)methyl)benzaldehyde

34=4-((7-nitro-9-oxo-9,10-dihydroacridin-2-ylimino)methyl)benzaldehyde

35=4-(4-(dimethylamino)benzylideneamino) acridin-9(10H)-one

36=2-(4-(dimethylamino)benzylideneamino) acridin-9(10H)-one

37=4-(4-(dimethylamino)benzylideneamino)-7-nitroacridin-9(10H)-one

38=2-(4-(dimethylamino)benzylideneamino)-7-nitroacridin-9(10H)-one

39=2-((9-oxo-9,10-dihydroacridin -4-ylimino) methyl) benzoic acid

40=2-((9-oxo-9,10-dihydroacridin -2-ylimino) methyl) benzoic acid

41=2-((7-nitro-9-oxo-9,10-dihydroacridin -4-ylimino) methyl) benzoic acid

42=2-((7-nitro-9-oxo-9,10-dihydroacridin -2-ylimino) methyl) benzoic acid

43= methyl 4-((9-oxo-9,10-diydroacridin -4-ylimino) methyl) benzoate

44= methyl 4-((9-oxo-9,10-diydroacridin -2-ylimino) methyl) benzoate

45= methyl4-((7-nitro-9-oxo-9,10-diydroacridin-4-ylimino)methyl) benzoate

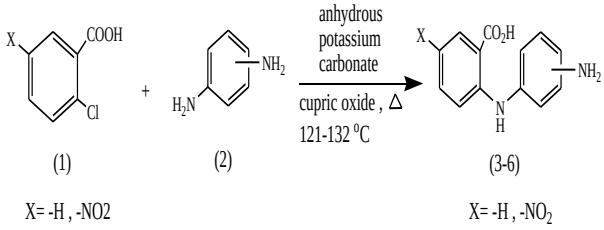
46= methyl4-((7-nitro-9-oxo-9,10-diydroacridin-2-ylimino)methyl) benzoate

General method [21,22]

Similarly, 0.0008 mol of compounds (7-10) (Table2) were dissolved separately in 30 ml dry methanol with stirring. 0.0008 mol of Terphthaldehyde, 2-formyl benzoic acid 4-(dimethylamino) benzaldehyde , methyl-4-formyl benzoate each has been added indivitually to each of (7-10)solutions . The final solution was refluxed each for 6hrs. Then each was checked by[TLC] technique .The mixture finally cooled and evaporated the solvent . The pricipate was filtered by vacuum and dried in lab. condition , followed with crystallization using ethanol . The Physical data have been arranged in Table (5).

3. Results and discussion

In this present work a new Schiff bases were synthesized from amino acridone and the biological activity of the prepared compounds against bacteria. The compounds N-aryl anthranilic acids compounds (3-6) were prepared by Ullman reaction , where the compound 2-chlorobenzoic acid or 2-chloro-5-nitro benzoic acid (1) was condense with ortho or para pheneylene diamine (2) in presence anhydrous potassium carbonate and the catalyst cupric oxide , as in scheme1.

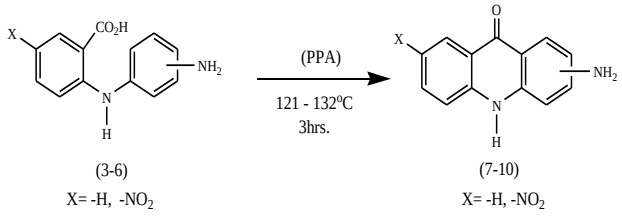


Scheme 1

The FTIR spectrum compounds (3-6) shows especial absorption bands (1651-1671) cm^{-1} belong to vib. of (C=O) band,and the vib. of (C=C) band at (1605-1615)cm^{-1},whereas,the vib.of (NH_2, NH) band appeared at (3321-3366) cm^{-1} and finally the absorption frequencies at (3371-3456) cm^{-1} are belong to vib. of (O-H) band.

The ^1H NMR spectrum for compound (3) has shows : broad band (4.6-5.26) for 2H of [NH_2], and multiple band (6.62-6.58) for the [3H (Ar-H and NH)], and triplet band (6.67) for 1H [J is 8 Hz], and doublet at 6.82 for 1H (J is 8Hz), in addition triplet at 6.98 for 1H [J is 8Hz], and triplet band (7.27) for the 1H[J is 8Hz], and doublet band (7.86) for 1H[J is 8 Hz] , and single band (10.00) for 1H[COOH] [23,24,25].

3.1 Preparation of amino acridone derivatives (7-10) by heating the compounds (3-6) with poly (phosphoric acid) , scheme 2.



scheme2

Sample	-X	n NH2	mpoC	RF	Colour	Mwt	Structure	Y%
3	-H	4 NH2	197-201	0.36	Pall-brown	228.26	C13H12N2O2	**77.2%**
4	-H	2 NH2	186-188	0.44	Dark- black	228.26	C13H12N2O2	**70.4%**
5	-NO2	4 NH2	351 >	0.45	Brown	273.25	C13H11N3O4	**60.5%**
6	-NO2	2 NH2	217-221	0.32	Dark- black	273.25	C13H11N3O4	**57.3%**

Table 1: physical data for compounds (3-6)

Table 2: physical data for compounds (7-10)

Sample	-X	n NH2	mpoC	RF	Colour	Mwt	Structure	Y%
7	-H	4 NH2	297-301	0.57	Pall brown	210.24	C13H10N2O	**84.2%**
8	-H	2 NH2	240-241	0.41	Black	210.24	C13H10N2O	**89.1%**
9	-NO2	4 NH2	341 >	0.44	Dark black	255.24	C13H9N3O3	**100.0%**
10	-NO2	2 NH2	351 >	0.72	Dark black	255.24	C13H9N3O3	**84.2%**

Table 3: physical data for compounds (11-14)

Sample	Y	mpoC	RF	Colour	mwt	Structure	Y%
11	2 CH3	126-127	0.21	Pall-yellow	223.27	C15H13NO	**53.2%**
12	3 CH3	62-64	0.41	Greenish-yellow	223.27	C15H13NO	**50.1%**
13	4 CH3	186-191	0.42	Yellow	223.27	C15H13NO	**69.7%**
14	4 OCH3	221-224	0.56	Silver	239.27	C15H13NO2	**60.6%**

Sample	n NH_2	-X	Y	mp°C	R_F	Mwt	Structure	Colour	Y%
15	4 NH_2	-H	2 CH_3	346>	0.42	415.48	$C_{28}H_{21}N_3O$	Dark -orange	**54.2%**
16	2 NH_2	-H	2 CH_3	342>	0.78	415.48	$C_{28}H_{21}N_3O$	green	**57.9%**
17	4 NH_2	NO_2-	2 CH_3	241	0.35	460.49	$C_{28}H_{20}N_4O_3$	brown	**65.2%**
18	2 NH_2	NO_2-	2 CH_3	305-306	0.63	460.49	$C_{28}H_{20}N_4O_3$	Dark-black	**40.2%**
19	4 NH_2	-H	3 CH_3	321 >	0.81	415.48	$C_{28}H_{21}N_3O$	Pall- Orange	**43.2%**
20	2 NH_2	-H	3 CH_3	332>	0.15	415.48	$C_{28}H_{21}N_3O$	Dark- black	**54.2%**
21	4 NH_2	NO_2-	3 CH_3	301-303	0.32	460.49	$C_{28}H_{20}N_4O_3$	Dark- black	**40.2%**
22	2 NH_2	NO_2-	3 CH_3	316>	0.21	460.49	$C_{28}H_{20}N_4O_3$	Dark- black	**58.1%**
23	4 NH_2	-H	4 CH_3	326-328	0.69	415.48	$C_{28}H_{21}N_3O$	Pall-brown	**32.1%**
24	2 NH_2	-H	4 CH_3	316>	0.52	415.48	$C_{28}H_{21}N_3O$	Dark- black	**55.3%**
25	4 NH_2	-NO_2	4 CH_3	171-173	0.31	460.49	$C_{28}H_{20}N_4O_3$	Pall-brown	**42.2%**
26	2 NH_2	-NO_2	4 CH_3	174-176	0.52	460.49	$C_{28}H_{20}N_4O_3$	Dark- black	**51.3%**
27	4 NH_2	-H	4 OCH_3	201-203	0.11	431.48	$C_{28}H_{21}N_3O_2$	Pall-yellow	**59.3%**
28	2 NH_2	-H	4 OCH_3	342 >	0.82	431.48	$C_{28}H_{21}N_3O_2$	Dark- brown	**51.2%**
29	4 NH_2	-NO_2	4 OCH_3	224-225	0.61	476.49	$C_{28}H_{20}N_4O_4$	Pall-green	**52.2%**
30	2 NH_2	-NO_2	4 OCH_3	224-225	0.61	476.49	$C_{28}H_{20}N_4O_4$	Pall-green	**49.3%**

Table 4: physical data for compounds (15-30)

The FTIR spectrum for the compounds (7-10) has shows especial absorption band (3366-3465) cm^{-1} belong to vib. of (NH , NH_2) bands, (1615-1659) cm^{-1} vib. of (C=O) band, (1559-1627) cm^{-1} of (C=C) band, and (1327-1508) cm^{-1} vib. of (NO_2 sym. and asym.) for compounds (9-10).

The ^1H NMR spectrum for compound 7: broad band (5.26-5.76) for 2 H of [NH_2], and multiple band (7.15-7.03) for 2H [Ar -H], and triplet band (7.23) for 1 H [J is 8 Hz], also triplet band (7.56) for 1H [J is 4Hz] , and multiple band (7.74-7.64) for 2 H [J is 8Hz] , in addition doublet band (8.21) for 1H [J is 8 Hz], and single band (10.69) for 1H [NH].[26,27]

3.2 Mono Schiff base of Terphthaldehyde compounds (11-14) were prepared by condensation of 1 mole of Terphthaldehyde with 1 mole of orth or meta or p-toluidin021.0e or p-anisidine .

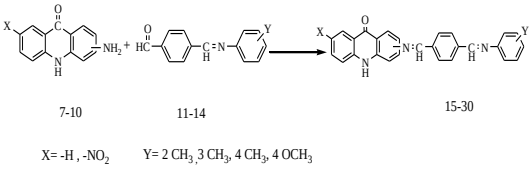
The FTIR spectrum for the compounds (11-14) has shown especial absorption band (1617-1623) cm^{-1} belong to (C=N) band, (1576-1594)cm^{-1} vib. of (C=C) band, (1696-1704) cm^{-1} vib. of (CHO) band, and (2952-2977) cm^{-1} vib. of (CH_3) band, (3018-3035) cm^{-1} vib. of Ar (C-H) band, (1022-

1284) cm^{-1} vib. of Ar ($O-CH_3$) band for compound (14), [18]

Sample	n NH_2	-X	Y	Z	mp	R_f	Colour	mwt	Structure	Y%
31	4 NH_2	-H	CHO	H	320>	0.6	Pall-brown	326.36	$C_{21}H_{14}N_2O_2$	**50.2%**
32	2 NH_2	-H	CHO	H	314-317	0.7	Green	326.36	$C_{21}H_{14}N_2O_2$	**45.2%**
33	4 NH_2	$-NO_2$	CHO	H	323-324	0.4	Black	371.36	$C_{21}H_{13}N_3O_4$	**55.1%**
34	2 NH_2	$-NO_2$	CHO	H	298-301	0.5	Black	371.36	$C_{21}H_{13}N_3O_4$	**42.2%**
35	4 NH_2	-H	$N(CH_3)_2$	H	289	0.2	Orange	341.42	$C_{22}H_{19}N_3O$	**53.2%**
36	2 NH_2	-H	$N(CH_3)_2$	H	219-220	0.61	Yellow	341.42	$C_{22}H_{19}N_3O$	**62.1%**
37	4 NH_2	$-NO_2$	$N(CH_3)_2$	H	276-277	0.3	Brown	386.42	$C_{22}H_{18}N_4O_3$	**40.2%**
38	2 NH_2	$-NO_2$	$N(CH_3)_2$	H	266-267	0.8	Orange	386.42	$C_{22}H_{18}N_4O_3$	**51.1%**
39	4 NH_2	-H	H	CO_2H	262-263	0.3	Pale Green	342.36	$C_{21}H_{14}N_2O_3$	**66.2%**
40	2 NH_2	-H	H	CO_2H	283-285	0.8	Greenish-Brown	342.36	$C_{21}H_{14}N_2O_3$	**68.3%**
41	4 NH_2	$-NO_2$	H	CO_2H	290-293	0.79	Brown	387.36	$C_{21}H_{13}N_3O_5$	**58.1%**
42	2 NH_2	NO_2-	H	CO_2H	331>	0.35	Green	387.36	$C_{21}H_{13}N_3O_5$	**52.2%**
43	4 NH_2	-H	CO_2CH_3	H	191-194	0.32	Brown	356.36	$C_{22}H_{16}N_2O_3$	**65.2%**
44	2 NH_2	-H	CO_2CH_3	H	341>	0.7	Green	356.36	$C_{22}H_{16}N_2O_3$	**59.1%**
45	4 NH_2	$-NO_2$	CO_2CH_3	H	326-328	0.72	Black	401.36	$C_{22}H_{15}N_3O_5$	**49.2%**
46	2 NH_2	$-NO_2$	CO_2CH_3	H	311-312	0.5	Black	401.36	$C_{22}H_{15}N_3O_5$	**40.2%**

Table 5: physical data for compounds (31-46)

3.3 Compound (15-30) were prepared by reflux the following (7-10) compounds each with the following compounds (11-14) separately in methanol and produce the Schiff bases (15-30), as shows in Scheme 3 .



Scheme 3

The FTIR of compound (15) : is 3378 [Amine], 1621 [Carbonyl], 1598 [Imine], 1561 [Alkene] .The FTIR of compound (16): is 3270 [Amine], 1632 [Carbonyl], 1640[Imine], 1566 [Alkene]. The ^{1}H NMR spectrum of compound (16) : is 2.35 [s , 3H , CH_3] , (7.11 – 7.32) [m , 3H], 7.59 [d, 1H, J=8Hz] , 7.65 [d, 1H, J is 8Hz], 7.75 [t, 1H, J is 8Hz] 7.86 [d , 1H, J is 8Hz] ,8.11-8.16 [m , 5H], 8.55 [s, 1H, N=CH] , 8.87[s , 1H , N=CH] , 11.91 [s, 1H , NH] . [28] The FTIR of compound (17) : is 3350 [Amine], 1682 [Carbonyl], 1623 [Imine] , 1576[Alkene], 1504, 1588 [sym, asym NO_2]. The ^{1}H NMR spectrum of compound (17) **:** is 2.3 [s , 3H , CH_3] , 6.44-7.87 [m, 14H , Ar-H] 8.9 [s , 1H, N=CH], 8.51[s,1H, N =CH] , 10.11[s ,1H , NH]. [26,27,28]

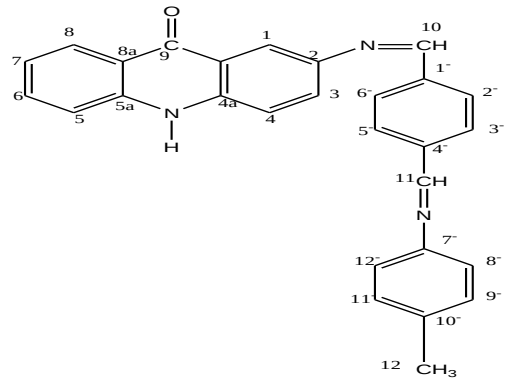
The FTIR of compound (18) : is 3371 [Amine], 1681 [Carbonyl], 1623[Imine], 1588 [Alkene], 1504, 1591 [sym, asym NO_2] .The FTIR of compound (19) : is 3351 [Amine], 1631 [Carbonyl], 1624[Imine], 1595 [Alkene].The FTIR of compound (20): is 3374 [Amine], 1641 [Carbonyl], 1603 [Imine], 1589 [Alkene]. The FTIR of compound (21) : is 3391 [Amine], 1681 [Carbonyl], 1619 [Imine] , 1577 [Alkene],1504, 1588 [sym, asym NO_2].The FTIR of compound (22) : is 3376[Amine], 1681 [Carbonyl], 1622 [Imine], 1590 [Alkene],1503, 1590 [sym, asym NO_2].The FTIR of compound (23): is 3442 [Amine], 1621 [Carbonyl], 1630 [Imine], 1581 [Alkene]. The ^{1}H NMR spectrum of compound (23): is 3.25 [s , 3H, CH_3], 7.26 – 8.38 [15H ,Ar-H], 8.46 [s ,1H , N=CH], 9.07 [s, 1H , N=CH], 10.82[s, 1H , NH]. The FTIR of compound (24): is 3267 [Amine], 1628 [Carbonyl], 1640 [Imine], 1567 [Alkene].

The ^{1}H NMR spectrum of compound (24): is 2.33 [s , 3H, CH_3], 7.25-8.26 [m , 15H , Ar-H], 8.68 [s , 1H , N=CH], 8.87[s, 1H , N=CH], 10.82[s, 1H , NH].

The ^{13}C NMR spectrum of compound (24) : is 21.11 [C_{12}] ,114.51 [C_4] ,117.44 [C_5] ,117.70 [C_3] ,119.05 [C_1] ,120.72 [C_6] ,121.34 [$C_{10'}$] ,121.58 [C_{9a}] ,121.67 [$C_{9'}$] ,121.68 [$C_{11'}$] ,121.73 [C_{8a}] ,126.52[C_8] ,128.84 [C_7] , 129.35 [$C_{3'}$] ,129.37 [$C_{5'}$] ,129.68 [$C_{2'}$] ,129.67 [$C_{6'}$] ,129.67 [$C_{12'}$] ,129.68 [$C_{8'}$] ,133.98 [C_{5a}] ,136.27 [C_{4a}] ,138.94 [C_2] ,140.15 [$C_{1'}$] ,140.17 [$C_{4'}$] ,144.75 [$C_{7'}$] ,149.04 [C_{11}] ,159.49 [C_{10}] ,177.23 [C_9] [29].

The FTIR of compound (25): is 3023 [Amine], 1681 [Carbonyl], 1615 [Imine], 1588 [Alkene], 1504, 1588 [sym, asym NO_2]. The FTIR of compound (26): is 3373 [Amine], 1681 [Carbonyl], 1625 [Imine], 1582 [Alkene] 1506, 1591 [sym, asym NO_2]. The FTIR of compound (27): is 3378

[Amine], 1631 [Carbonyl], 1602 [Imine], 1588 (Alkene), 1022 Ar[-methoxy].



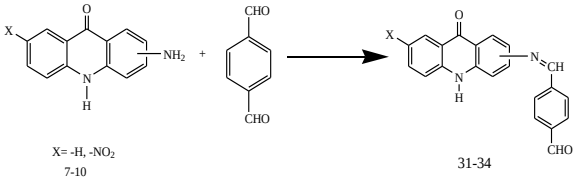
Compound (24)

The FTIR of compound (28): is 3264 [Amine], 1627 [Carbonyl], 1694 [Imine], 1567 [Alkene], 1026 [Ar- methoxy]. The FTIR of compound (29): is 3372 [Amine], 1661 [Carbonyl], 1623 [Imine], 1576 (Alkene), 1027 (Ar- methoxy),1505, 1587 (sym, asym NO_2). The FTIR of compound (30): is 3393 [Amine], 1662 [Carbonyl], 1622 [Imine], 1584 [Alkene], 1023 [Ar - methoxy],1504, 1592 [sym, asym NO_2].

The ^{1}H NMR spectrum of compound (30) : is 3.81 [s, 3H , OCH_3], 6.98 – 7.05 [m , 3H], 7.30 [t, 1H, J is 8Hz], 7.32-7.38 [m , 3H], 7.55-7.86 [m , 3H], 8.03 [s ,1H] ,8.11-8.19 [m, 2H], 8.27 [d,1H, J is 8Hz], 8.61 [s, 1H , N =CH], 8.86[s, 1H , N =CH], 11.92 [s ,1H , NH].

3.4 Preparation of 4-((9-oxo-9,10-dihydroacridin-4-and-2-ylimino) methylbenzaldehyde derivatives compounds (31-34).

Compounds (31-34) were prepared by reflux of (1 mol) of each compounds (7-10) each with (1mol) terphthaldehyde in methanol to from the Schiff bases (31-34) , as shows in Scheme 4.

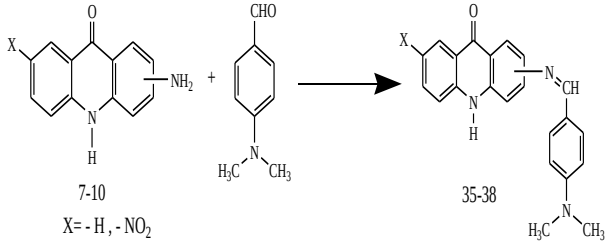


Scheme 4

The FTIR of compound (31): is 3236-3471 [Amine], 1711 [Aldehyde]1630 [Carbonyl], 1621 [Imine], 1592 [Alkene].The FTIR of compound (32): is 3216-3455 [Amine], 1706 [Aldehyde], 1629 [Carbonyl], 1613 [Imine], 1588 [Alkene].The FTIR of compound (33): is 3272-3461 [Amine], 1719 [Aldehyde], 1663 [Carbonyl], 1621 [Imine], 1599 [Alkene] 1333, 1437 [sym, asym NO_2].The FTIR of compound (34): is 3253-3457 [Amine], 1709 [Aldehyde], 1657 [Carbonyl], 1614 [Imine], 1597 [Alkene] 1324, 1480 [sym, asym NO_2].

3.5 Preparation of 2-and- 4-(4- (dimethylamino] benzylideneamino) acridin -9(10H)- one derivatives compounds (35-38).

Compounds (35-38) were prepared by reflux of (1 mol) of each compounds (7-10) each with (1mol) 4-(dimethylamino)benzaldehyde) in methanol to form the Schiff bases , as shows in Scheme 5.



Scheme 5

The FTIR of compound (35): is 3243-3391 [Amine], 1629 [Carbonyl], 1606 [Imine], 1571 [Alkene].

The ^{1}H NMR spectrum of compound (35): is 3.06 [s ,6H , $2CH_3$], 6.86 [d , 2H ,J is 8], [7.24-7.31] [m , 2H], 7.62 [d ,1 H , J is 8Hz] ,7.74 [t ,1 H , J is 8Hz] , [8.04-8.26] [m , 4H] , 8.72 [s , 1H , N =CH] ,10.73 [s , 1H ,NH] .[30, 31]

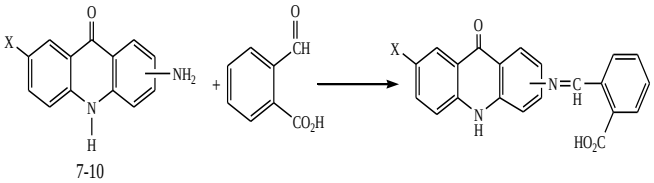
The FTIR of compound (36): is 3236-3411 [Amine], 1624 [Carbonyl], 1607 [Imine], 1604 [Alkene]. The FTIR of compound (37): is 3243-3391 [Amine], 1643 [Carbonyl], 1614 [Imine], 1576 [Alkene], 1324, 1484 [sym, asym NO_2].The FTIR of compound (38): is 3234-3411 [Amine], 1641 [Carbonyl], 1611 [Imine], 1586 [Alkene], 1323, 1480 [sym, asym NO_2].

3.6 Preparation of the following compounds of [2-[[9-oxo -9,10 dihydroacridin-2-and -4-ylimino] methyl] benzoic acid derivatives compounds] (39-42).

Compounds (39-42) were prepared by reflux of 0.00041 mol of the following (7-10) each with 0.00041 mol [2-formyl benzoic acid] dissolve in methanol to prepare the Schiff bases , as shows in Scheme 6.

The FTIR of compound (39): is 3322[OH], 3264 [Amine], 1773[Carboxylic acids], 1654 [Carbonyl], 1625 [Imine], 1596 [Alkene] . The ^{1}H NMR spectrum of compound (39): 7.02 [d ,1H , J is 8Hz] , 7.19 [d , 1 H , J is 8Hz] , 7.25 - 7.32 [

m, 2 H] , 7.54 -7.61 [m , 2 H] , 7.64 – 7.75 [m , 2 H] , 7.78 – 7.84 [m , 1H] , 7.89 [d , 1H , J is 8Hz] , 7.88 –7.93 [m , 2 H] , 8.17 – 8.23 [m ,1 H] , 10.64 [s , 1H , NH] [32] .

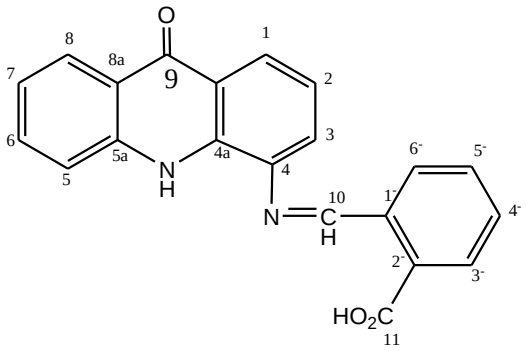


7-10

X= -H, -NO_2 39-42

Scheme 6

The ^{13}C-NMR spectrum: 113,98 [C $_4$] , 116.41 [C $_5$] , 118,01 [C $_1$] , 118.16 [C $_{4'}$] , 120.48 [C $_{9a}$] , 121.36 [C $_7$] , 121.69 [C $_{8a}$] , 121.91 [C $_8$] , 121.91 [C $_{3'}$] , 125.27 [C $_3$] , 126.37 [C $_{5'}$] , 126.37 [C $_6$] , 130.13 [C $_{4a}$] , 131.34 [C $_{6'}$] , 133.52 [C $_{5a}$] , 133.91 [C $_{1'}$] , 135.01 [C $_2$] , 137.30 [C $_{10}$] , 141.09 [C $_{2'}$] , 177.23 [C $_{11}$] , 177.48 [C $_9$]. [33]

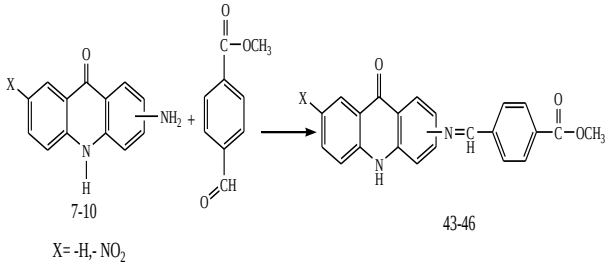


Compound (39)

The FTIR of compound (40): is 3347[OH], 3264 [Amine], 1751[Carboxylic acids], 1648 [Carbonyl], 1611 [Imine], 1596 [Alkene] .The FTIR of compound (41): is 3330 [OH], 3276 [Amine], 1761[Carboxylic acids], 1651 [Carbonyl], 1621 [Imine], 1597 [Alkene], 1331, 1513 [sym, asym NO_2]. The FTIR of compound (42): is 3347 [OH], 3266 [Amine], 1751 [Carboxylic acids], 1641 [Carbonyl], 1611 [Imine], 1592 [Alkene], 1327, 1512 [sym, asym NO_2].

3.7 Preparation of the following compound of [methyl 4 –[[9-oxo-9, 10-diydroacridin-2-and -4-ylimino] methyl]benzoate derivatives](43-46).

Compounds (43-46) were prepared by reflux of 0.0001 mol of the following (7-10) each with 0.0001 mol (methyl-4-formyl benzoate) in methanol to form the Schiff bases (43-46), as shows in scheme 7.



7-10 43-46

X= -H,- NO_2

Scheme 7

The FTIR of compound(43): is 3440 [Amine], 1721[methyl acetate], 1638 [Carbonyl], 1596 [Imine], 1544 [Alkene].The FTIR of compound (44): is 3267 [Amine], 1723 [methyl acetate], 1630 [Carbonyl], 1590 [Imine], 1571 [Alkene]. The FTIR of compound (45): is 3412 [Amine], 1724 [methyl acetate], 1641 [Carbonyl], 1617 [Imine], 1599 [Alkene], 1327, 1512 [sym, asym NO_2]. The ^{1}H NMR spectrum: 3.93 [s, 3 H, OCH_3], 7.84 – 7.86 [m , 2 H], 8.05 [d,1 H, J is 8Hz], 8.16 – 8.24[m, 4 H], 8.32 [d, 1 H , J is 8Hz], 8.44 [d, 1H , J is 8Hz], 8.50 – 8.51 [m ,1H], 8.98 [d, 1 H, J is 12Hz], 13.56 [s, 1 H ,NH]. [32]The FTIR of compound (46): is 3413 [Amine], 1717 [methyl acetate], 1642 [Carbonyl], 1603 [Imine], 1588 [Alkene], 1329, 1512 [sym, asym NO_2].

Biological activities studies:

The biological activities results have shown that the Schiff base compounds were shown kill effect activity against tested bacteria and same activity for other bacteria therefore they shown biological activities better than the applied standard compounds. The synthesized compounds appeared different biological activity on the four selected bacteria. Moreover, eight of acridones prepared Schiff bases (22, 43, 25, 30, 31, 18, 39, 35) are tested for their biological activities by appling the following bacteria, *[[Escherichia coli , Klepsiella pneumoniae, Pseudomonas aeroginosa , Staphlococcus aurous]]*.

The Schiff base 22 give high inhibition against the *[Klepsiella pneumoniae]*, also high inhibition against the used bacteria *[Escherichia coli],[Staphlococcus aurous] and [Pseudomonas aeroginosa]*. whereas, compound 31 give more inhibition against *[Staphlococcus aurous]* and less effect against other bacterial , though it has shown better biological activities also for all used bacteria . Compound 43 give more inhibition against *[Staphlococcus aurous]* also the compound 30 has better inhibition against *[Staphlococcus aurous]*, whereas the compounds 25 ; 18 ; 39 gives more inhibition against *[Escherichia coli]* and

finally, the compound 35 has given more inhibition activity against *[Klepsiella pneumoniae]* . In general , the examined acridones have given good activity toword the examined bacterial in comparison with the controlled sample.

Growth inhibition zone size of

M1= 2-nitro-5-((4-((7-nitro-9-oxo-9,10-dihydroacridin-4-ylimino)methyl) phenyl) methylene amino)acridin-9(10H)-one

M2=2-((9-oxo-9,10-dihydroacridin -4-ylimino) methyl) benzoic acid

M3= methyl 4-((9-oxo-9,10-diydroacridin -4-ylimino) methyl) benzoate

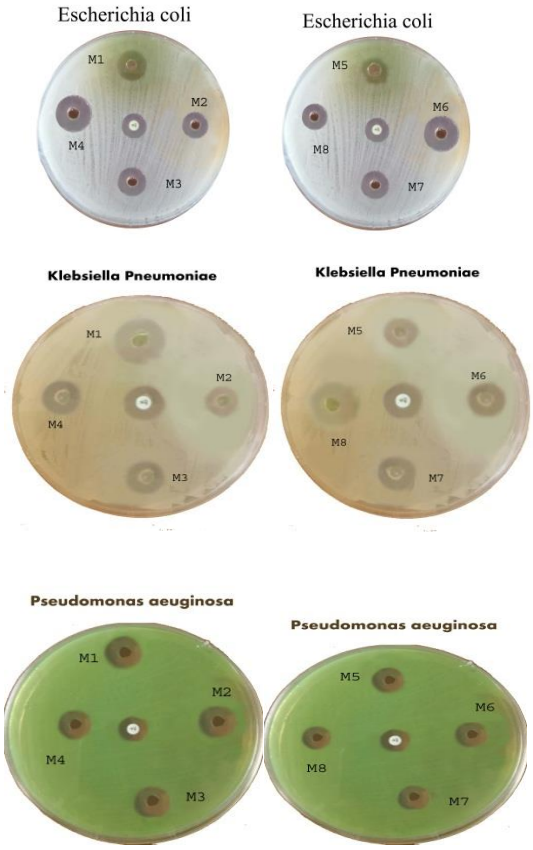
M4=4-(4-((P-tolylimino)methyl) benzylideneamino) -7-nitro acridin -9(10H) –one

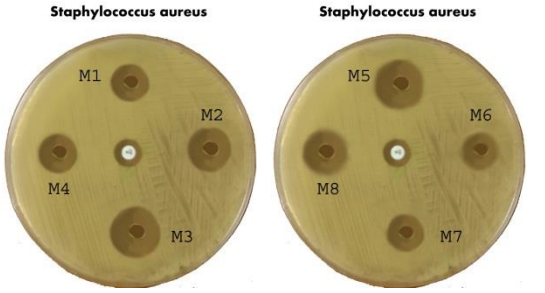
M5=2-(4-((4-methoxyphenylimino)methyl) benzylideneamino)-7-nitro acridin -9(10H) –one

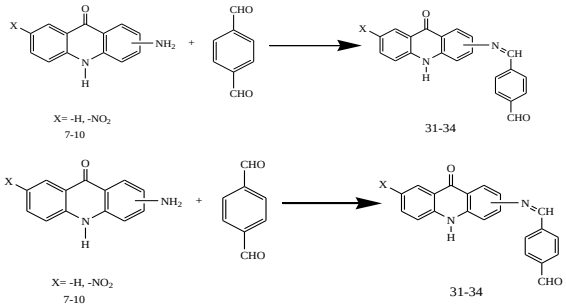
M6=2-(4-((o-tolylimino)methyl) benzylideneamino) -7-nitroacridin -9(10H) –one

M7=4-((4-((9-oxo-9,10-dihydroacridin-4-ylimino)methyl)phenyl)methyleneamino)acridin-9(10H)-one

M8= 4-(4-(dimethylamino) benzylideneamino) acridin-9(10H)-one







Conclusion

A new some Schiff bases were synthesized by reaction of four amino acridones derivatives. The aforisade amino acridones were reacted once with mono Schiff bases and then with Terphthaldehyde, 4-(dimethyl amino)benzaldehyde, 2-formyl benzoic acid and methyl-4-formyl benzoate . The synthesized products were characterized using FTIR, ^{1}H NMR and ^{13}C NMR spectroscopy. Some of the synthesized products were tested for their antibacterial activities against *[Escherichia coli , Klepsiella pneumoniae,Staphlococcus aurous, Pseudomonas aeroginosa]* .

Acknowledgment

The authors are thankful to university of Mosul , Iraq . For providing research facilities to carry out this work.

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