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Research Article

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Antibacterial and antifungal activities of derivatives of 4-amino salicylic acid

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ABSTRACT

Two new amino substituted azomethine compounds with general formula R^1 N= CH R^2. Here R^1 is 4-aminosalicylic acid R^2 is 3,5-diiodosalicylaldehyde and 5-formyl salicylic acid were prepared by the reaction of 4-amino salicylic acid and two substituted aldehydes in ethanol. Such compounds were characterized by different physiochemical techniques like melting point, Elemental analysis, ^{1}HNMR, UV-Visible, Emission and IR spectra. The azomethine compounds were screened for antibacterial and antifungal activity.

Key words: 4-amino salicylic acid, 3, 5-diiodosalicylaldehyde and 5-formyl salicylic acid, antibacterial and antifungal

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INTRODUTION

Azomethine is condensation products of primary amine with carbonyl compounds. It is first reported by Schiff [1] in 1864. The common feature of these compounds is the group with a general formula $R^1N=CHR^2$. The azomethine compounds of 4-amino salicylic acid and its derivatives are known for their variety of applications [2-4]. They are used as substrates in the preparation of a number of industrial and biologically active compounds via ring closure, cycloaddition, and replacement reactions [5]. Moreover, azomethine compounds are also known to have biological activities such as antimicrobial [6-8], antifungal [9-11], antitumor [12-14] and as a herbicide [15]. They have also been employed as ligands for compound of metal ion. 4-amino salicylic acid is an excellent antituberculosis, antibacterial and antifungal [16].

EXPERIMENTAL SECTION

Materials and solvents

4-amino salicylic acid, 3, 5-diiodosalicylaldehyde, 5-formyl salicylic acid, Ethanol, Acetone and DMSO were purchased from Alfa Aesar.

Instruments

Melting points were determined using Thomas Hoover capillary melting point apparatus. The ^{1}HNMR spectra were recorded on a Bruker AV-300 FT NMR Spectrometer using DMSO as a solvent. The IR spectra were recorded on Cary 630 FTIR spectrophotometer using KBr pellets. The UV spectra were recorded on a Cary series UV-Vis spectrophotometer. The Fluorescence spectra were recorded on a Cary Eclipse Fluorescence spectrophotometer. The biological activities were screened by disc diffusion method.

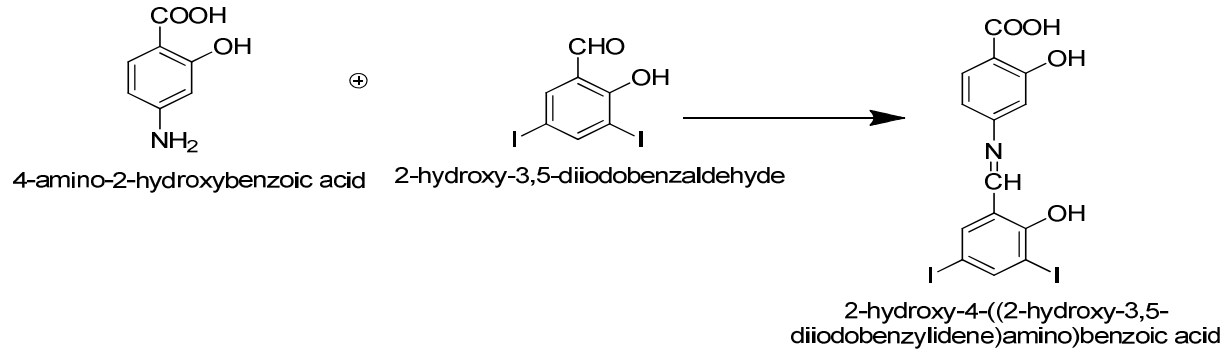
Preparation of 2-hydroxy-4-((2-hydroxy-3, 5-diiodobenzylidene)amino)benzoic acid

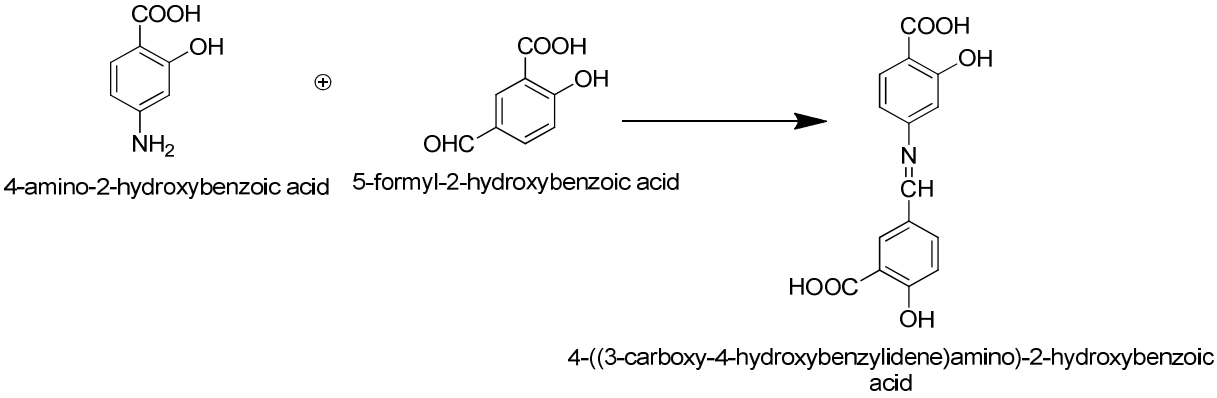
Three grams of 4-amino salicylic acid was mixed with four grams of 3, 5 - Diiodosalicylaldehyde and was grained well in acidic medium at room temperature. The mixture was transferred into hundred milliliters round bottom flask and was reflexed for three hours in oil bath. The solid product formed was filtered, washed with ethanol and then

dried over vacuum desiccator. The melting point was noted. The azomethine compound was soluble in Ethanol and DMSO.

Preparation of 4-((3-Caboxy-4-hydroxybenzylidene) amino)-2-hydroxy benzoic acid

Six grams of 4-amino salicylic acid was mixed with seven grams of 5-formyl salicylic acid and was grained well in acidic medium at room temperature. The mixture was transferred into hundred milliliter round bottom flask and were reflexed for five hours in oil bath. The solid product formed was filtered, washed with ethanol and then dried over vacuum desiccator. The azomethine compound was soluble in Ethanol and DMSO.





Antimicrobial susceptibility test by Disc diffusion Technique

Principle

Disc impregnated with known concentration of antibiotics are placed on an agar plate that has been inoculated uniformly over the entire plate with a culture of the bacterium to be tested. The plate is incubated for twenty to twenty eight hours at 38^0C. During this period, the antimicrobial agent diffuses through the agar and may prevent the growth of the organism. Effectiveness of susceptibility is proportional to the diameter of the inhibition zone around the disc. Organisms which grow up to the edge of the disc are resistant.

Procedure

The plate was labeled with the name of the culture, sample and standard at the bottom of the plate. Then sterile cotton swab on a wooden applicator stick was dipped into the bacterial suspension. Excess fluid was removed by rotating the swab and was rubbed gently over the plate to obtain uniform distribution of the inoculums. The sterile disc was held on the inoculated plate with the help of micropipette. The sample was leveled in the sterile disc and incubated at 37^0C in an incubator. After incubation the diameter of the zone of inhibition of growth was measured.

Antibacterial activity

The bacterial cultures for *Staphylococcus aureus*, Basillus *subtilis*, *Klebsiella aerogenes*, *Esherichia coli* were obtained from National Chemical Laboratory Pune. The azomethine compounds were stored at room temperature and were dissolved five µg /ml in DMSO as a solvent. They were screened for bacteria by disc diffusion method [16]. Ciprofloxacin was used as a standard drug. Zone of inhibition were measured and compared with the controls.

Antifungal activity

Pathogenic strains of *Aspergillus niger and Candida albicans* were obtained from National Chemical Laboratory Pune. The azomethine compounds were stored dry at room temperature and dissolved hundred µg /ml in DMSO as a

solvent. Antifungal activities of each compound were evaluated by Agar diffusion disc method [17]. The effect produced by the sample was compared with the effect produced by the positive controls.

RESULTS AND DISCUSSION

The physical and analytical data of 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene) amino) benzoic acid and 4-((3-Caboxy-4-hydroxybenzylidene)amino)-2-hydroxy benzoic acid were shown in Table 1.

Table 1

S. No	Molecular Formula	Molecular Weight	Color	Physical state	Solubility	Melting Point	Yield (in %)	Elemental Analysis (in %)				
								C	H	I	N	O
1	$C_{15}H_{12}I_2NO_4$	523.89	Dark reddish brown	Solid	DMSO	194^oC	89.8	33.00	1.768	49.90	2.75	12.57
2	$C_{16}H_{14}NO_6$	316.08	Wine red	Solid	DMSO	140^oC	96	59.8	4.65	-	31.8	3.65

FTIR (cm^{-1}) spectra of 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene)amino)benzoic acid.
3791(-OH),1589(-CH=N-),2916(-COOH),1281(-CO).

^{1}HNMR spectra of 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene)amino)benzoic acid.
11.13 (s, Ha), 8.95 (s, Hb), 8.31 (s, Hc), 8.19 (d, Hd) (2.1 cps), 7.93 (s,He), 7.43 (s, Hf), 5.81 (s, Hg).

UV-Vis (nm) spectra of 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene)amino)benzoic acid.
255nm(n →π*), 339nm(π →π*).

FTIR (cm^{-1}) spectra of 4-((3-Caboxy-4-hydroxybenzylidene)amino)-2-hydroxy benzoic acid.
3890(-OH),1622(-CH=N-),3161(-COOH),1288(-CO).

^{1}HNMR spectra of 4-((3-Caboxy-4-hydroxybenzylidene)amino)-2-hydroxy benzoic acid.
11.13 (s,Ha), 8.37 (s,Hb), 8.23 (s,Hc), 8.11 (d, Hd) (J=2.1 cps) , 8.06 (d, He) (1.8cps) , 7.23 (d, Hf) (2.1cps) , 7.19 (s,Hg), 6.66 (d,Hh) (2.4 cps), 5.90 (s,Hi).

UV-Vis (nm) spectra of 4-((3-Caboxy-4-hydroxybenzylidene)amino)-2-hydroxy benzoic acid.
257nm(n →π*), 568nm(π →π*).

Antibacterial activity
Antibacterial activity of 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene)amino)benzoic acid and 4-((3-Caboxy-4-hydroxybenzylidene)amino)-2-hydroxy benzoic acid were carried out against *Staphylococcus aureus, Basillus subtilis, Klebsiella aerogenes and Esherichia coli* by disc diffusion method and the results obtained were formulated in Table 2. The test was carried out in DMSO solution at a concentration of hundred units. Results were compared with standard drug Ciprofloxacin at the same concentration. 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene)amino)benzoic acid and 4-((3-Caboxy-4-hydroxybenzylidene) amino)-2-hydroxy benzoic acid were highly active against bacteria.

Antibacterial activity of 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene) amino) benzoic acid and 4-((3-Caboxy-4-hydroxybenzylidene)amino)-2-hydroxy benzoic acid were shown in table 2

Table 2

S.No	Name of the Microorganisms	Zone of inhibition in mm		
		290687	290689	Standard
1	*Staphylococcus aureus*	18	19	35
2	*Basillus subtilis*	16	21	40
3	*Klebsiella aerogenes*	18	20	30
4	*Esherichia. coli*	19	20	38

Antifungal activity
Antifungal screening of 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene)amino)benzoic acid and 4-((3-Caboxy-4-hydroxybenzylidene)amino)-2-hydroxy benzoic acid were carried out against *Aspergillus niger*[12] and *Candida albicans* by disc diffusion method and the results obtained were formulated in Table 3. The test was carried out in DMSO solution at a concentration of hundred units. Results were compared with standard drug nystatin at the same

concentration. 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene)amino)benzoic acid and 4-((3-Caboxy-4-hydroxy benzylidene) amino)-2-hydroxy benzoic acid were highly active against fungus.

Antifungal activity of 2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene) amino) benzoic acid and 4-((3-Caboxy-4-hydroxybenzylidene)amino)-2-hydroxy benzoic acid were shown in table 3.

Table 3

S.No	Name of the Microorganisms	Zone of inhibition in mm		
		290687	290689	Standard
1	*Aspergillus niger*	14	16	35
2	*Candida albicans*	16	20	32

CONCLUSION

2-hydroxy-4-((2-hydroxy-3,5-diiodobenzylidene) amino) benzoic acid and 4-((3-Caboxy-4-hydroxy benzylidene)amino)-2-hydroxy benzoic acid have been showed that they were antibacterial and antifungal.

REFERENCES

[1] Z Cimerman; S Miljanic; N Galic, *Croatica Chemica. Acta*., **2000**, 73(1), 81-95.
[2] EA Liberta; D Xwest, *Inorg. chem. Acta*., **2010**, 363(1),157-162.
[3] MA Jasim; A Karawi, *Transition Metal Chem*., **2009**, 34(8), 891-897.
[4] M Alam; DU Lee, *Crystallo. chem*., **2011**,10,1007-1027.
[5] FD Karia; PH Parsania, *Asian J. of Chem.,* **1999**,11, 991-995.
[6] PG More; RB Bhalvankar; S Pattar. *J. of Indian Chem. Soc.,* **2001**, 78,474-475.
[7] AH El-Masry; HH Fahmy; SHA Abdelwahed, *J. of Medi. Chem.,* **2000**, 5, 1429-1438.
[8] MA Baseer; VD Jadhav; RM Phule; YV Archana; YB Vibhute, *Orient. J. of Chem.,* **2000**,16,553-556.
[9] SN Pandeya; D Sriram; G Nath; E De Clercq; *IL Farmaco*, *J. of Medi.chem.,* **1999**, 54, 624-628.
[10] WM Singh; BC Dash, *J. of Medi. Chem.,* **1988**, 22, 33-37.
[11] EM Hodnett; WJ Dunn, *J. of Medi. Chem.,* **1970**, 13, 768-770.
[12] SB Desai; PB Desai; KR Desai, *J. of Medi. Chem.,* **2001**, 7, 83-90.
[13] P Pathak; VS Jolly; KP Sharma, *Orient. J. of Chem.,* **2000**, 16,161-162.
[14] S Samadhiya; A Halve, *Orient. J. of Chem.,* **2001**, 17, 119-122.
[15] F Aydogan;N Öcal; Z Turgut; C Yolacan, *Bull. Korean Chem. Soc.*, **2001,** 22, 476-480.
[16] A Rahman; MI Choudhary; WJ Thomsen, Bioassay Techniques for Drug Development, Harwood Academic Publishers, Netherlands., **2001.**
[17] V Niraimathi; A Jerad Suresh; S Latha; S Chitra Bala, *International Journal of Pharmacy and Pharmaceutical Sciences*., **2012,** 4(3), 212-214**.**