at d.fferent conc. of $Na_4P_2O_7$. Eight such half cells were set up for each conc. of $Na_4P_2O_7$.

*Calculations of Standard Potential*[3] ($E°$) :

The value of E° of cobalt-cobalt pyrophosphate electrode was determined by the method employed by Lewis and Randoll[4]. The standard electrode potential for the cobalt-cobalt pyrophosphate electrode was found to be $-0{\cdot}367$ V.

Department of Chemistry, W. U. MALIK.
University of Roorkee, Y. P. SINGH.
Roorkee (U.P.), India, M. P. SINGH.
*September* 15, 1975.

1. Pearce, J. N. and Ough, L. D., *J. Am. Chem. Soc.*, 1938, 60, 80.
2. Harned, H. S., *Ibid.*, 1929, 51, 416.
3. Glasstone, S., *An Introduction to Electrochemistry*, D. Van Nostrand, New York, 1962, p. 271.
4. Lewis, G. N. and Randall, M., *Thermodynamics*, McGraw-Hill Book, Co., Inc., New York, 1923, p. 334.

## ACETATES OF COBALT AND COPPER AS SPRAYING REAGENTS FOR THE DETECTION OF SOME OPIUM ALKALOIDS

OPIUM and its alkaloids have been detected on thin layer plates by various spraying reagents, which were reviewed by Santavy[1]. Deniges reagent[2], iodine fuming and subsequent exposure to pyrrole vapours[3], have been reported as detecting agents for opium alkaloids.

In the present paper, detection of opium alkaloids, by aqueous solutions of acetates of copper and cobalt, has been described. The developed thin layer plates are first sprayed with an aqueous solution of either copper acetate or cobalt acetate. Then both the plates have been subsequently sprayed with a saturated solution of ammonium thiocyanate in acetone. The second spray with the saturated solution of ammonium thiocyanate in acetone revealed the alkaloids as coloured spots. The colour of the spots is due to the formation of a complex of cobalt (II) thiocyanate and copper (II) thiocyanate with alkaloids.

Glass plates of size 20 × 20 cm were coated with silica gel G(E/M), approximately to a thickness of 300 $\mu$m and the plates after air drying, were activated at 110° C for one hour. Then the plates were cooled in a desiccator. Methanolic solution of morphine and chloroform solutions of codeine, narcotine, papaverine and thebaine were spotted on the plates by means of a micropipette. The plates were then developed in a solvent mixture of benzene : methanol (80 : 20). After the solvent front had moved to 10–12 cm, the plates were taken out of the solvent chamber and dried with a hair drier.

(*a*) The plates was sprayed with 5% aqueous solution of cobalt acetate and dried for 15 minutes and then sprayed with a saturated solution of ammonium thiocyanate in acetone. The alkaloids formed deep greenish blue spots on a very light blue background. Minimum detectable limits by this reagent system are 5 $\mu$g for morphine, narcotine, thebaine and papaverine, and 30 $\mu$g for codeine. It was observed that with the spray of 5% aqueous solution of cobalt acetate alone and subsequent hot air treatment, the alkaloids gave violet coloured spots on a white background.

(*b*) A second plate was sprayed with 5% aqueous solution of copper acetate and dried for 15 minutes as above. The plate was then sprayed with the saturated solution of ammonium thiocyanate in acetone, which revealed the alkaloids as chocolate brown coloured spots. Minimum limits of detection with this spray reagent are 5 $\mu$g for morphine, narcotine, papaverine and thebaine and 25 $\mu$g for codeine.

The authors thank Dr. S. N. Garg, Director, Central Forensic Science Laboratory, Hyderabad, for his interest and encouragement.

Central Forensic Science Laboratory, N. V. RAMA RAO.
Bureau of Police Research and Development H. R. K. MURTY.
(Ministry of Home Affairs),
Government of India, 5-9-201/2, Chiragali Lane,
Hyderabad 500 001 (A.P.), *September* 15, 1975.

1. Santavy, F., In : E. Stahl (Editor), *Thin Layer Chromatography*, A Laboratory Hand Book, Springer, New York, 1969.
2. Guven, K. C., and Aran, B., *Anal. Abstr.*, November 1973, 25. 3340.
3. Rama Rao, N. V. and Murthy. H. R. K., *J. ind. Acad. For Sci.* (13), 1974, p. 18.

## NEW MERCURATED SULFONAMIDES AS POTENTIAL PESTICIDAL PROPERTIES

RECENTLY, sulfonamides which have wide-spread use as bactericide[1], have also been found to possess fungicidal[2] properties and a large number of them synthesised[3,4] and tested for their pesticidal behaviour. For such purpose, mercurated sulfonamides, substituted aniline bases treated with halo alkyl, arylalkyl or aryl sulfonyl chloride[5] and aryl sulfonamides[6] have been prepared. Guha-Sircar and Ismet Ali[7] also synthesised a series of mercurated sulfonamides and reported potent bactericidal properties for their compounds.

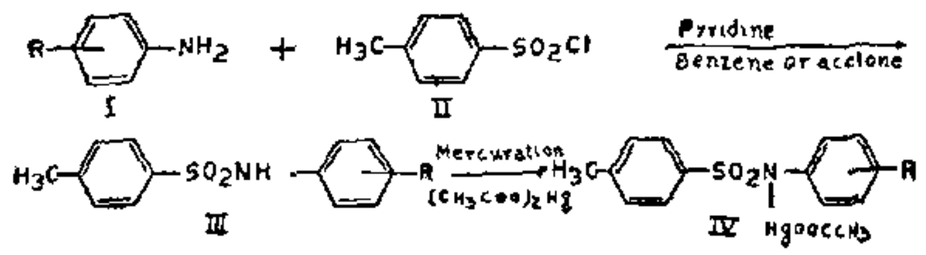
TABLE I

*Nature of the synthesized compounds and their properties*

| Sl. No. | Nature of R | M.P. (°C) | Yield/ | Mercury percentage | | Pesticidal properties | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Found | Calculated | Antifungal | | | Antibacterial | |
| | | | | | | A.N. | C.G. | E.S. | E.C. | S.A. |
| 1. | H– | 250 | 60 | 39·3 | 39·5 | + | + | + | + | + |
| 2. | 2-methyl | 225 | 58 | 38·0 | 38·5 | + | + | + | + | + |
| 3. | 3-methyl | 210 | 65 | 38·1 | 38·5 | – | – | – | + | – |
| 4. | 2-methoxy | 240 | 50 | 37·0 | 37·3 | – | – | – | – | – |
| 5. | 3-methoxy | 260 | 51 | 37·1 | 37·3 | – | – | – | + | + |
| 6. | 4-ethoxy | 205 | 64 | 37·0 | 37·2 | ++ | ++ | + | ++ | ++ |
| 7. | 2-chloro | 180 | 58 | 36·8 | 37·0 | ++ | ++ | + | + | + |
| 8. | 3-chloro | 260 | 55 | 36·7 | 37·0 | + | + | + | + | + |
| 9. | 2-nitro | 262 | 50 | 36·0 | 36·3 | – | – | – | + | + |
| 10. | 3-nitro | 275 | 55 | 36·7 | 36·3 | ++ | ++ | ++ | + | + |
| 11. | 4-nitro | 215 | 52 | 36·1 | 36·3 | ++ | ++ | ++ | + | + |
| 12. | 2-methyl-4-chloro | 247 | 50 | 35·6 | 36·0 | ++ | + | + | ++ | – |
| 13. | 2-nitro-4-methyl | 242 | 51 | 35·1 | 35·4 | – | – | – | – | – |
| 14. | 2-methoxy-4-nitro | 237 | 60 | 34·6 | 35·0 | – | – | – | – | – |
| 15. | 3-nitro-6-methyl | 236 | 58 | 35·1 | 35·4 | ++ | ++ | + | ++ | + |
| 16. | 3-nitro-6-methoxy | 230 | 61 | 34·8 | 35·0 | ++ | + | + | + | – |

(–) inferior to Zineb.
(+), (++) greater toxicity over Zineb to the extent of (0–50/) and (51–100/) respectively.

This approach was made use of by the author in her current studies towards development of new series of mercurated sulphonamide type of compounds using a wide range of aniline bases with $-CH_3$, $-OCH_3$, $-OC_2H_5$, $-Cl$, $-NO_2$ substituents, singly or in combination, and condensing them with *p*-toluenesulfonyl chloride. The following general reactions have been stipulated :




Mercurated sulfonamides were prepared by condensing 0·1 mole of each aniline base (I) with 0·1 mole of *p*-toluenesulfonyl chloride (II) in presence of 1 : 1 pyridine and benzene or acetone. The mixture was refluxed in water bath for four hours, after which the solvent was removed under reduced pressure. The N-(R-phenyl) *p*-toluenesulfonamide (III) so formed was recrystallised in ethanol and subjected to mercuration taking their equimolar ratio dissolved in ethanol, and dilute acetic-acid respectively. The reaction was completed under constant stirring and refluxing for one hour. The mercurated compound (IV) separating out was recrystallised from acetic-acid. The structure of the compound was established through acid hydrolysis and subsequent identification of the decomposition products. Their composition was verified by estimation of mercury[8] as mercuric sulfide.

Pesticidal properties of the compounds were tested by standard methods[9,10] against three fungi, namely, *Aspergillus niger* (A. N.), *Chetomium globossum* (C. G.) and *Rhizoctonia solani* (R. S.) and two bacteria *i.e., Escherichia coli* (E. C.) and *Staphylococcus aureus* (S. A.) at a concentration of $1 \times 10^{-5}$ mole/ml of the compound dissolved in ethanol or acetic acid-ethanol mixture. The toxicity of the compounds was determined on these cultures by measuring the zone of inhibition and their relative toxicity was rated against 'Zineb' (Zinc-ethylenebis-dithiocarbamate), as a standard. The physical and pesticidal properties are tabulated in Table I.

It may be concluded that the compounds containing 4-ethoxy, 2-chloro, 3 and 4-nitro and 2-nitro-6-methyl have relatively strong dual purpose toxicity for plant pathogens and bacteria.

The author is grateful to the authorities of Harcourt Butler Technological Institute, Kanpur, for providing facilities of the work.

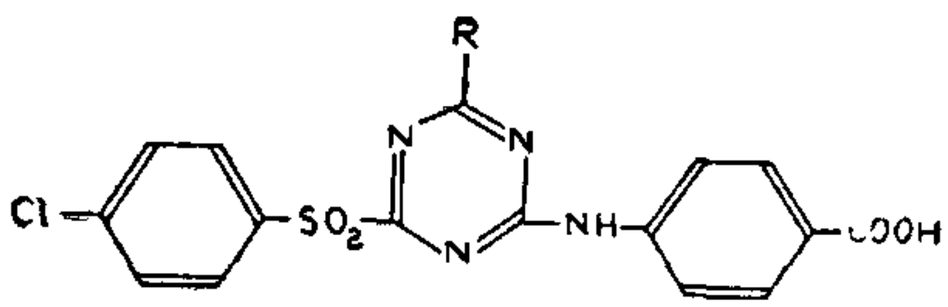
Department of Petroleum (MRS.) GEETA BAIJAL.
Technology,
Indian School of Mines, Dhanbad 826 004,
*September* 15, 1975.

1. Budesiusky, Z., Bydzovsky, V., Prikryl, J. and Svab, J., *Ceskoeslov. Farm.*, 1961, 10, 14 ; *Chem. Abstr.*, 1961, 55, 25972e.
2. Angelo, J., Speziale, and Gino, J., *U.S. Pat.*, 1966, 3, 256. 148 ; *Chem. Abstr.*, 1966, 65, 6231h.

3. Julian, B, Zygmunt, E., Zdzislaw, E., Bogumil, H., Wieslaw, S. and Jacek, S., *Prezemysl. Chem.*, 1961, 40, 561 ; *Chem. Abstr.*, 1962, 57, $12523_h$.
4. Deo, K., *Japan Pat.*, 1959, p. 4328 ; *Chem. Abstr.*, 1963, 58, $10205_e$.
5. Friendrich, M., *German Pat.*, 1959, p. 106238 ; *Chem. Abstr.*, 1961, 55, $14379_d$.
6. Hans, J., Dietz, Wilhelm, B. and Frank, B., *Ger. Pat.*, 1956, p. 17905 ; *Chem. Abstr.*, 1961, 55, $1531_i$.
7. Guha, S. S. and Ismet Ali, *J. Ind. Chem. Soc.*, 1951, 2, 28.
8. Lomhalt, S. and Christiansen, J. A., *Comp. Rend. Lab. Cerlberg.*, 1931, 10, 259.
9. Riber, A. J. and Riber, R. S., *Introduction to Research on Plant Diseases*, Academic Press, New York, U.S.A., 1936.
10. Mehrotra, G. and Dey, A. N., *J. Ind. Chem. Soc.*, 1973, 50, 793.

## ANTIBACTERIAL ACTIVITY OF *s*-TRIAZINYL ARYL/ALKYL SULPHONES

*p*-AMINOBENZOIC acid derivatives have been found to be powerful local anaesthetics[1] and possess bacteriostatic property[2]. *s*-Triazine derivatives also possess therapeutic activity against malaria[3], cancer[4] and viral diseases[5]. We[7] have prepared 4'-(2-*p*-chlorophenylsulphonyl-4-aryl/alkylamino-*s*-triazine-6-yl)-aminobenzoic acids of the type (I) and tested for antibacterial activity.




(I)

where R = arylamino, alkylamino, etc.

The first chlorine of the cyanuric chloride was reacted with *p*-chlorothiophenol[6] at 0° C, leading to the formation of 2, 4-dichloro-*s*-triazine-6-yl *p*-chlorophenyl sulphide. The second chlorine was condensed with *p*-aminobenzoic acid at 30°–35° and the third chlorine at 80°–90° with different bases using dioxane as the solvent. The product was then oxidised to the corresponding sulphones[7].

*Antibacterial Testing.*—The following strains were used for testing the antibacterial activity :

A. Gram-positive bacterial strains like *Bacillus subtilis* and *Staphylococcus aureus.*

B. Gram-negative bacterial strains like *Escherichia coli,, Xanthomonas citri, Salmonella typhosa, Shigella shiga* and *Pseudomonas aeruginosa.*

Thirty-one sulphones were tested using dilution broth method *in vitro*. Loopful suspensions prepared from the above actively growing micro-organisms were inoculated into the nuterient broth containing different concentrations (800, 500, 400, 250, 200 and 100 μg/ml) of the sulphones and incubated for 24 hours at 37° C. The minimum inhibitory concentrations (MIC) were determined in μg/ml.

*p*-Bromoanilino, *p*-iodoanilino and 2, 4, 6-tribromoanilino derivatives were found to be most active as they inhibited the growth of Gram-positive bacteria at 200 μg/ml and Gram-negative bacteria at 400 μg/ml. The other substituents in the benzene ring of arylamino group like methyl, *m*-chloro, methoxy, ethoxy, nitro, hydroxy, sulpho, other heterocyclic derivatives like pyridylamino, morpholino, piperidino and alkyl-amino, arylalkyl-amino derivatives inhibited the growth of *B. subtilis* and *S. aureus* at 250 μg/ml ; *E. coli, X. citri, P. aeruginosa* at 400 μg/ml ; *S. typhosa* and *S. shiga* at 500 μg/ml.

*o*-, *m*- and *p*-carboxyanilino derivative inhibited the growth of Gram-positive bacteria at 250 μg/ml and Gram-negative bacteria at 500 μg/ml.

Authors are thankful to Saurashtra University for providing research facilities and research fellowship to one of us (M. H. G.).

Department of Chemistry, Saurashtra University, Bhavnagar,
M. H. GOGHARI.
K. S. PATEL.*
A. R. PARIKH.

*December* 23, 1975.

* Microbiology Department, Sir P. P. Institute of Science, Bhavnagar-2.

1. Einhorn, A. and Uhfelder, E., *Ann.*, 1909, 371, 131.
2. Johnson, T. B. and Lane, F. W., *J. Amer. Chem. Soc.*, 1921, 43, 348.
3. Curd, F. H. S., Landquist, I. K. and Rose, F. L., *J. Chem. Soc.*, 1947, p. 154.
4. Burchenal, J. H., Johnston, S. F., Cremer, M. A., Webber, L. F., and Stock, C. C., *Proc. Soc. Exptl. Biol. Med.*, 1950, 74, 708.
5. CIBA Ltd., B. P. 754071, 1956. U.S.P. 2824088, 1958.
6. Drabek. J. and Skrobal, M., *Chem. Zvesti*, 1963. 17 (7), 482.
7. Goghari, M. H. and Parikh, A. R., *J. Indian Chem. Soc.*, 1976, 53, 207.

## DRUGS ON PROTEIN BINDING OF TOLBUTAMIDE

SULPHONYL ureas have been reported to bind extensively to plasma proteins[1-2]. Displacement of sulphonyl ureas by number of acidic drugs has been well demonstrated in human serum[1-3] and in solutions of purified albumin[4-5]. The studies reported herein explore the influence of some drugs not reported earlier on protein binding of tolbutamide.