We have also studied the absorption spectra in the ultraviolet, of the above solutions at 15 and 51°, and in some cases at 25°. The spectra show peaks at 240 ± 0.5 mμ and 335 ± 0.5 mμ. We have established that the peak at 335 mμ is almost entirely due to the dimer, and that the one at 240 mμ is due to contributions both from Fe^{3+} and $FeOH^{2+}$. The results have been used to evaluate $K_{2,2}$ at 15 and 51°, and these are found to be in agreement with those obtained from the magnetic data. The value obtained at 25° from magnetic data is in reasonable agreement with that reported by Hedström.

This work adds to the small group of known substances or ions in which exchange effects destroy all the paramagnetism normally present in iron (III). It also suggests that the well known subnormal magnetic moment for the iron in hydrous ferric oxide[4] may be due to part of the iron being present as dimers built into the gel structure. Just prior to precipitation almost half the iron in a 0.04 *M* solution is present as dimer.

This work was performed under contract with the Signal Corps Engineering Laboratories, Army Signal Corps.

(4) P. W. Selwood, M. Ellis and K. Wethington, THIS JOURNAL, **71**, 2181 (1949).

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FUROCHROMONES AND COUMARINS. XI. THE MOLLUSCICIDAL ACTIVITY OF BERGAPTEN, ISOPIMPINILLIN AND XANTHOTOXIN

Sir:

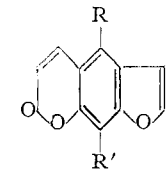
Though several thousands of synthetic organic compounds have been screened for molluscicidal activity, very little is known about the activity of naturally occurring compounds. We have investigated the molluscicidal activity of the naturally occuring furocoumarins, *e.g.*, bergapten (I), isopimpinillin (II) and xanthotoxin (III) against *Biomphalaria boissi*, the intermediate host of *Schistosoma mansoni* (Bilharzia) in Egypt. It was found that the molluscicidal power of bergapten and isopimpinillin is of the same order of magnitude as that of the most powerful synthetic organic compounds, *e.g.*, dinitro-*o*-cyclohexylphenol and sodium pentachlorophenate, I being stronger than II, III being less potent. I, II and III are neither caustic nor irritating as is the case with many synthetic molluscicides.

These findings may explain—at least in part—the role of furocoumarins in the vegetable kingdom (protection of plants against snails) and may open a new method in the control of *Biomphalaria boissi*, namely, by growing plants which contain these active furocoumarins and after harvesting throwing the plants into the channels infected by the snails (*Biomphalaria boissi*).

Egyptian plants are known to contain active furocoumarins, *e.g.*, *Ammi majus* L contains xanthotoxin.[1]

(1) A. Schönberg and A. Sina, *Nature*, **161**, 481 (1948).

I, R = OCH_3, R′ = H
II, R = R′ = OCH_3
III, R′ = OCH_3, R = H



The results of our preliminary experiments were confirmed and extended by Dr. G. T. Evans and Mr. R. Zachary from the United States Naval Medical Research Unit No. 3 (Cairo) to whom we are greatly indebted. Their results are given below:

Test Conditions.—Compare D. O. Hoffman and R. Zachary, *Am. J. Trop. Med. and Hyg.*, **2**, 332 (1953). Test temperature 26°. Exposure period 24 hours in the presence of the chemical followed by 72 hours observation period in fresh pond water.

Chemical solutions were made in acetone, an aliquot taken and diluted to the desired concentration. The solvent in itself was not toxic to snails at the dose used.

Snails used were obtained from a drain (natural habitat) near the village of Geziret Mohammed and stocked in out-door concrete ponds fitted for snail colonization. Natural water was used after being filtered through a cotton layer. The percentage figures refer to snails killed.

TABLE I

Compound	p.p.m. = parts per million 5 p.p.m.	2 p.p.m.
I	32/32 (100%)	22/32 (69%)
II	22/32 (69%)	3/32 (9%)
DCHP[2]	13/16 (81%)	14/32 (44%)
DOW G[3]	10/16 (63%)	2/32 (6%)

III in a concentration of 10 p.p.m. and under the above conditions killed only 25% (4/16) of the snails tested and 0% (0/16) in a concentration of 5 p.p.m. The kill was 100% (10/10) when the concentration was 50 p.p.m. and the exposure and observation periods were 24 hours.

(2) DCHP = Dinitro-*o*-cyclohexylphenol, R. E. Kuntz, *The Lebanese Medical Journal*, 46 (1952); R. E. Kuntz and M. A. Stirewalt, *Proc. Helminth. Soc. Washington*, **17**, 95 (1950).

(3) Dow G. = Sodium pentachlorophenate, A. Halawani, N. Latif and T. Anwar, *J. Roy. Egypt. Med. Assoc.*, **34**, 163 (1951); E. G. Berry, M. O. Nolan and O. Gonzales, *Health Repts.*, **65**, 939 (1950).

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RECEIVED JUNE 28, 1954

THE ACTION OF OXALYL CHLORIDE ON INDOLES: A NEW APPROACH TO TRYPTAMINES

Sir:

Interest in the physiological actions of tryptamine derivatives has been stimulated considerably by the proposals of Woolley and Shaw[1] and Gaddum[2] that serotonin (I) may play a role in central nervous system function. The possibility that the remarkable hallucinogenic effects of lysergic acid diethylamide may be due to its effect as a serotonin antimetabolite has been proposed.[1,2] These

(1) D. W. Woolley and E. Shaw, *Brit. Med. J.*, 122–126 (1954).

(2) J. H. Gaddum, Ciba Foundation Symposium, London (1953).