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THE STRUCTURE OF SOME INDOLIC CONSTITUENTS IN *Couroupita Guaianensis* Aubl.

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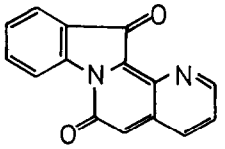
Recently Dutta *et al.*[1] isolated a yellow compound (m.p. 265-266°; designated couropitine A) assigned structure 1, which would constitute a novel type of alkaloid structure. The assignation was, however, only based on spectroscopic evidence which to our minds (and others[2]) did not exclude alternative structures.

For this reason we have now repeated the extraction and purification procedure as described by the Indian workers and isolated couropitine A and the red-violet compound, earlier[1] designated couropitine B, as well as (thus confirming an earlier report by Lewis[3]) indigo (2).

We would now like to report that couropitine A is in fact 6,12-dihydro-6,12-dioxoindolo-[2,1-b]quinazoline (3a), a compound with a long history[4] (obtained by O'Neill already in 1892). The structure has been established[5] by X-ray crystallography. Recently Zähner *et al.*[6] isolated 3a from *Candida lipolytica* grown under artificial conditions (addition of large amounts of tryptophan to the culture solution). The German workers found that the compound was an antibiotic (designated tryptanthrine). The recorded MS, IR and NMR spectra[6] seem to be in agreement with the data reported (and partly misinterpreted) by Dutta *et al.*[1]

Compound 3a, m.p. 268[4], 261[7], can readily, *albeit* in bad and varying yields, be synthesized[7] by treating isatin with hot aqueous $KMnO_4$. Other[7] methods (including two recent syntheses[8,9]) did not offer any advantages and for this reason a new and simple method (also suitable for substituted derivatives such as 3b and 3c) was developed: Heating (95-110°) the appropriate isatin and isatoic anhydride in equimolar amounts in pyridine for 2-4 hrs followed by cooling and collection of crystals (yields: 75-90 %).



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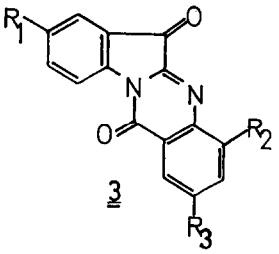


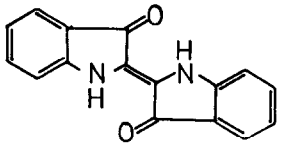
3

a $R_1=R_2=R_3=H$ (m.p. 267-268°)

b $R_1=Br$, $R_2=R_3=H$ (m.p. 285-286°)

c $R_1=H$, $R_2=R_3=Cl$ (m.p. 303-305°)

d $R_1=R_3=Br$, $R_2=H$ (m.p. 326-328°)



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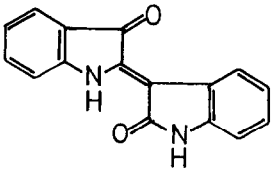

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Couropitine B was found to be identical with indirubin (4), a common congener[10,11] with indigo in various plants, *e.g.* in some *Indigofera* species.

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REFERENCES

1. A.K. Sen, S.B. Mahato and N.L. Dutta, *Tetrahedron Letters* 609 (1974).
2. J.A. Joule, in "The Alkaloids", ed. J.E. Saxton, The Chemical Society, London (1975) p. 193.
3. Y.S. Lewis, *Curr. Sci.* 33, 682 (1964).
4. H. Machemer, *Ber.* 63, 1341 (1930) and refs. therein.
5. W. Fedeli and F. Mazza, *J. Chem. Soc., Perkin Trans. 2*, 1621 (1974).
6. W. Schindler and H. Zähner, *Arch. Microbiol.* 79, 187 (1971).
7. P. Friedländer and N. Roschdestwensky, *Ber.* 48, 1841 (1915).
8. C.W. Bird, *Tetrahedron* 19, 901 (1963).
9. R. Kikumoto and T. Kobayashi, *Tetrahedron* 22, 3337 (1966).
10. E. Epstein and P.G. Miles, *Bot. Mag.* (Tokyo) 79, 566 (1966).
11. A.G. Perkin and A.E. Everest, "The Natural Organic Colouring Matters", Longman, Green and Co., London (1918), pp. 475-528.