Novel Total Synthesis of (±)-Erysotramidine, an Oxo-erythrinan Alkaloid

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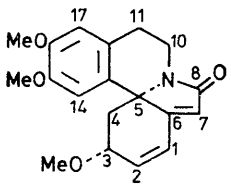
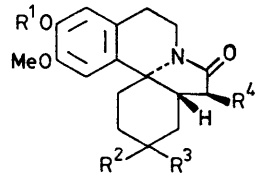
Summary A simple synthetic route to (±)-erysotramidine (**1**), an oxo-erythrinan alkaloid, including the novel ring cleavage of the aza-tricyclo[3.2.0.0] compound (**6**) with phenylselenyl chloride is reported.

IN connection with our synthetic work on compounds related to alkaloids of the *Erythrina* species, we have now synthesized a racemic form of erysotramidine (**1**), an oxo-erythrinan alkaloid isolated from *Erythrina arborescens* Roxb.[1] We have reported already a convenient method for



(1)

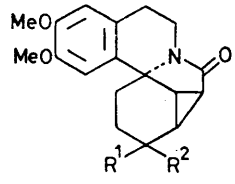


(2) $R^1=R^4=H$, $R^2R^3=O$

(3) $R^1=Me$, $R^2R^3=$  , $R^4=OH$

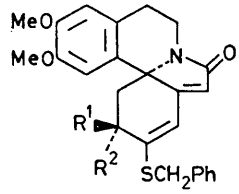
(4) $R^1=Me$, $R^2R^3=$  , $R^4=OSO_2Me$

(5) $R^1=Me$, $R^2R^3=O$, $R^4=H$



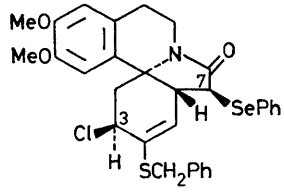
(6) $R^1R^2=O$

(7) $R^1=R^2=SCH_2Ph$

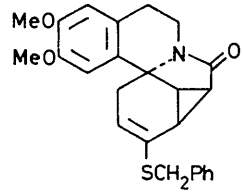


(8) $R^1=Cl$, $R^2=H$,

(9) $R^1=H$, $R^2=OMe$



(10)



(11)

the preparation of the key intermediate (**2**) in the syntheses of erythrinan alkaloids.[2]

Mesylation of the 7β-hydroxy acetal lactam (**3**),[2] m.p. 202—202·5 °C, with methanesulphonyl chloride in pyridine, followed by hydrolysis with 5% HCl–acetone and treatment of the resulting compound (**4**), m.p. 231—233 °C, with 10% NaOH–methanol afforded the pentacyclic compound (**6**),† m.p. 205—207 °C, ν_{max} ($CHCl_3$) 1685 (N–C=O) cm^{-1}; ^{13}C n.m.r. ($CDCl_3$) 30·53 (C-6) and 33·97 (C-1 and -7) p.p.m.; *m/e* 313 (M^+), in 85% yield. Compound (**6**) was converted with activated zinc metal into the tetracyclic compound (**5**), m.p. 163·5–164 °C, by refluxing in acetic acid for 8 h.

Thioacetalization of (**6**) with toluene-α-thiol and BF_3–ether in acetic acid at room temperature overnight afforded compound (**7**), m.p. 183—185 °C, ν_{max}($CHCl_3$) 1672 (N–C=O) cm^{-1}; *m/e* 527 (M^+). Treatment of (**7**) with phenylselenyl chloride‡ in anhydrous tetrahydrofuran at room temperature for 1 h gave the 7β-selenyl-3β-chloro derivative (**10**) in 62% yield, oil, ν_{max}($CHCl_3$) 1682 (N–C=O) cm^{-1}; *m/e* 611 (M^+), and the 3β-chloro-6,7-didehydro sulphide (**8**) (10·5%), m.p. 208—210 °C, ν_{max}($CHCl_3$) 1665 (N–C=O) cm^{-1}; *m/e* 453 (M^+). The 7β-selenyl compound (**10**) was also converted quantitatively with 15% H_2O_2–pyridine into (**8**) in dichloromethane at 5 °C for 15 min.

The resulting 3β-chloro derivative (**8**) was treated with $AgNO_3$ in refluxing absolute methanol for 4 h, affording the 3α-methoxy sulphide (**9**) in 50% yield, *m/e* 449 (M^+).

Finally, desulphurization of the sulphide (**9**) with deactivated Raney nickel (W-2) led quantitatively to the (±)-erysotramidine (**1**). The synthetic (±)-erysotramidine (**1**) was identical (i.r., ^1H n.m.r.) with natural erysotramidine.[1]

We are indebted to the Matsunaga Science Foundation for a research grant.

(*Received, 20th April* 1978; *Com.* 409.)

† Satisfactory analytical and spectroscopic data were obtained for all compounds.

‡ The sulphide (**11**), which is an intermediate in this reaction, was obtained quantitatively by treatment of (**10**) with phenylselenyl chloride at −30 °C for 30 min.

[1] K. Ito, H. Furukawa, and M. Haruna, *Yakugaku Zasshi*, 1973, **93**, 1611, 1617.
[2] M. Haruna and K. Ito, *J.C.S. Chem. Comm.*, 1976, 345.