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KINGISIDE AGLUCONE, A NATURAL SECOIRIDOID FROM UNRIPE FRUITS OF *STRYCHNOS SPINOSA**

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Key Word Index—*Strychnos spinosa*; Loganiaceae; Kingiside aglucone; secoiridoid; ^{13}C NMR.

Abstract—A new natural secoiridoid, kingiside aglucone, was isolated from unripe fruits of *Strychnos spinosa*. Its presence together with indole alkaloids, previously isolated from other parts of the plant, is of biogenetic interest.

INTRODUCTION

Strychnos spinosa Lam. is a small tree or shrub widely used in Africa in traditional medicine, as an analgesic and in the treatment of venereal diseases, stomach disorders, and snake bites [1]. In Malawi the fruits are eaten when ripe. The unripe fruits have a very bitter taste and are used as an emetic whilst the flesh is used to treat unretarded growth in children. The seeds are toxic, but in small doses they are used as an emetic [2].

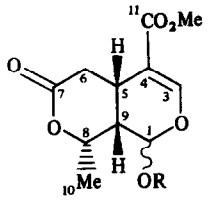
Three indole alkaloids had been isolated by us [3] from *S. spinosa*: akagerine, from the stem bark, and kribine, akagerine and 10-hydroxyakagerine, from the leaves. An unusual lactone, stryspinolactone, was recently isolated together with a known lignan, lirioresinol B, from ripe fruits which were reported to yield no alkaloids [4].

We now report the isolation of substance **1** from the methanolic extract of unripe fruits of *S. spinosa* collected in Malawi.

RESULTS AND DISCUSSION

Compound **1**, oil, $C_{11}H_{14}O_6$, $[M]^+$ at *m/z* 242 (49%), IR $\nu_{max}^{CHCl_3}$ 3590, 3340, 1700 (very broad) and 1630 cm^{-1} showed a UV maximum (EtOH) at 242 nm (log ε 3.78) and ^1H NMR signals at δ7.52 (1H, *d*, *J* = 1 Hz) and 3.84 (3H, *s*, OMe) characteristic of the conjugated carbomethoxyenol–ether system present in several iridoids. The free hemiacetalic equilibrium of the substance was evident by the presence of two doublets at δ5.88 (*J* = 2 Hz) and 5.36 (*J* = 9 Hz) (relative area/proton 0.7 and 0.3, respectively) in the ^1H NMR spectrum.

1 was identified as the secoiridoid aglucone of kingiside (**2**), a β-glucoside isolated from the fruits of *Lonicera alpigena* L. (Caprifoliaceae) [5] and of *L. morrowi* A. Gray [6]. Thus the coupling constant values of **1**, as well as of its monoacetyl derivative **3** ($C_{13}H_{16}O_7$) were practically identical to those reported in [7], whereas their ^1H and ^{13}C NMR chemical shifts (see Experimental and Table 1)



1 R = H

2 R = β-D- glucopyranosyl

3 R = Ac

Table 1. ^{13}C NMR chemical shifts assignments of **1** and **3***

C	1	3
1	91.1	88.3
3	151.9	152.2
4	109.2	110.6
5	25.1	26.4
6	32.9	33.0
7	172.2†	168.4†
8	75.2	74.3
9	35.6	37.4
10	17.7	17.9
11	167.1†	164.9†
OMe	51.3	51.4
OCOMe		170.0†
OCOMe		20.7

*Values in ppm.
†Assignments may be interchanged.

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agreed with those reported for tetraacetyl kingiside [5]. The β configuration of the acetoxy group in **3** ($J_{1,9}$ = 7 Hz) is opposite to the predominant one for the hydroxy group in **1**.

The co-occurrence of kingiside aglucone (**1**) and of indole alkaloids (although in different parts of the plant) is of biogenetic interest. Thus the presence of **1**, as that of boonein in *Alstonia boonei* [8], could suggest a different pathway, beyond that of loganin, to the monoterpenoidic moiety of the indole alkaloids.

Two other secoiridoids isolated from bitter unripe fruits and strictly related to **1** are morroside from *Lonicera morrowi* [6] and xylomollin from *Xylocarpus molluscensis* [9]. In preliminary tests, kingiside aglucone showed antifeedant activity [E. A. Bernays, personal communication] as already reported for xylomollin [9].

EXPERIMENTAL

^{1}H and ^{13}C NMR (Varian XL 100): $CDCl_3$, TMS as internal reference, proton–proton coupling constants confirmed by double irradiation if necessary.

Plant material. Fruits of *S. spinosa* were collected in Zomba (Malawi) in March 1984 and identified by Dr. J. H. Seyani, curator of National Herbarium, University of Malawi, where a voucher sample is kept (No. MSS 542).

Extraction and purification. Three unripe fruits of *Strychnos spinosa* were peeled and the flesh (650 g) pulped and eluted with MeOH. The residue of the extraction (30 g) was dissolved in H_2O (200 ml) and the soln extracted with EtOAc (3 × 150 ml, residue 12 g) and then with *n*-BuOH–sat. H_2O (3 × 150, residue 10 g). Part of the EtOAc residue was submitted to CC on silica gel (eluent EtOAc) to obtain crude **1**, which was further purified on Lobar LiChroprep RP-8 Merck (eluent MeCN–H_2O, 3:7) to give pure **1**, as a colourless oil (1.1% of the starting material).

Kingiside aglucone (**1**). $[\alpha]_D^{20}$ +137° (*c* 7.5, MeOH). ^{1}H NMR: δ1.58 (3H, *d*, $J_{8,3H\text{-}10}$ = 7 Hz, 3H-10), 2.12 (1H, *m*, H-9), 3.84 (3H, *s*, OMe), 4.92 (1H, *dq*, $J_{8,9}$ = 2 Hz, H-8), 5.36 (0.3H, *d*, $J_{1,9}$ = 9 Hz, H-1α), 5.88 (0.7H, *d*, $J_{1,9}$ = 2 Hz, H-1β), 7.52 (1H, *d*, $J_{3,5}$ = 1 Hz, H-3); MS *m/z* (rel. int.): 242 $[M]^+$ (9), 225 (13), 212 (38), 153 (35), 139 (65), 123 (100), 97 (53). (Found: C, 54.08; H, 5.80. Calc. for $C_{11}H_{14}O_6$: C, 54.54; H, 5.83%.)

Kingiside aglucone acetyl derivative (**3**). **1** was acetylated with a mixture of C_5H_5N and Ac_2O (1:1) for 4 hr at room temp. After addition of MeOH the soln was left for 20 min then evaporated to give crude **3** which was chromatographed on Lobar LiChroprep RP-8 Merck (eluent, MeCN–H_2O, 1:4) to give pure **3** as an oil. $[\alpha]_D^{20}$ −54° (*c* 0.8, MeOH). ^{1}H NMR: δ1.38 (3H, *d*, $J_{8,3H\text{-}10}$ = 7 Hz, 3H-10), 2.04 (3H, *s*, OCOMe), 2.30 (1H, *ddd*, $J_{1,9}$ = 7 Hz, $J_{5,9}$ = 7 Hz, $J_{8,9}$ = 2.5 Hz, H-9), 2.45 (1H, *dd*, $J_{5,6a}$ = 7 Hz, $J_{6a,6b}$ = 18 Hz, H-6a), 2.91 (1H, *dd*, $J_{5,6b}$ = 7 Hz, H-6b), 3.19 (1H, *m*, H-5), 3.64 (3H, *s*, COOMe), 4.60 (1H, *dq*, H-8), 6.19 (1H, *d*, H-1), 7.36 (1H, *d*, $J_{3,5}$ = 1 Hz, H-3); MS *m/z* (rel. int.): 284 $[M]^+$ (2), 242 (75), 224 (21), 164 (52), 152 (62), 139 (67), 136 (26), 43 (100). (Found: C, 54.70; H, 5.70. Calc. for $C_{13}H_{16}O_7$: C, 54.93; H, 5.67%.)

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