J. Pharm. Pharmacol., 1965, **17**, *Suppl.*, 39S–40S Received March 15, 1965

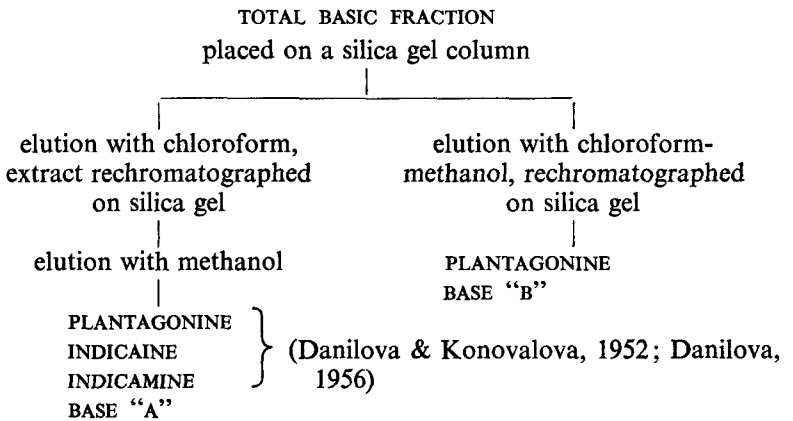
SHORT COMMUNICATION

Phytochemical studies of Egyptian *Plantago* species (alkaloids)

Z. F. AHMED, A. M. RIZK AND F. M. HAMMOUDA

THE alkaloidal content of eight species of *Plantago* common in Egypt has been examined. Authentication of the species has already been described (Ahmed, Batanouny & Hammouda, 1965). Extraction of the defatted seeds of *Plantago albicans* with 96% ethanol has yielded a basic fraction which was isolated either with mineral acid in the conventional manner or by precipitation with ammonium reineckate (Lee, 1960).

The behaviour of this extract on two-dimensional thin-layer chromatography is shown in Table 1. Column chromatography on silica-gel as outlined below has yielded five crystalline fractions.



Plantagonine had m.p. 220–222°, $[\alpha]_D^{20} + 29{\cdot}7°$ (*c*, 1·2, ethanol) (Danilova & Konovalova, 1952, cite m.p. 218–220°, $[\alpha]_D + 30{\cdot}8$).

The hydrochloride m.p. 227–229° (Danilova & Konovalova, 1952, cite m.p. 228–230°) gave no depression on admixture with an authentic specimen. The infrared spectra of the hydrochloride and of an authentic specimen were identical.

The picrate had m.p. 158–160° (Danilova & Konovalova, 1952, cite m.p. 159–160°).

Indicaine, an oil, gave a picrate m.p. 148–150° (Danilova & Konovalova, 1952, cite m.p. 149–150°). Oxidation of the oily base with silver oxide (Danilova, 1956) yielded plantagonine.

Indicamine picrate had m.p. 125–127° (Danilova & Konovalova, 1952, cite m.p. 124–127°).

From the Medicinal Plants and Crude Drugs Research Unit, National Research Centre, Dokki, Cairo, U.A.R.

TABLE 1. Rf* OF *Plantago albicans* BASIC FRACTION (TWO-DIMENSIONAL THIN-LAYER CHROMATOGRAPHY) ON KIESELGEL GF 254 (250 μ)

Spot No.	Base	Rf		Fluorescence colour (200–400 mμ)
		Solvent A	Solvent B	
1	Base "A"	0·03	0·05	Pale yellow
2	Plantagonine	0·06	0·07	,, ,,
3	Base "B"	0·11	0·12	,, ,,
4	Unidentified	0·28	0·07	Light bluish yellow
5	,,	0·37	0·44	Blue
6	,,	0·48	0·28	Greenish yellow
7	,,	0·60	0·65	Light greenish yellow
8	Indicamine	0·72	0·45	Violet
9	Indicaine	0·80	0·54	,,
10	Unidentified	0·84	0·92	Yellow
11	,,	0·14	0·09	Faint violet
12	,,	0·29	0·15	Yellowish green
13	,,	0·37	0·54	Blue

* Mean values of five determinations.
Solvent A: Ether : methanol : diethylamine (85 : 10 : 5) (Sandberg & Michel, 1962)
,, B: Chloroform : methanol : diethylamine (92 : 3 : 5). (,, ,, ,,)
N.B.: Spots 5 and 13 may be interchangeable.

Bases A and B have been obtained in crystalline form and characterised as follows.

Base A, m.p. 240°, λ_{max} (ethanol) 280 mμ. Found: C, 75·1; H, 8·9; N, 7·5. $C_{12}H_{17}ON$ requires C, 75·4; H, 8·9; N, 7·4%. Picrate m.p. 280–282° (decomp.). Found: C, 51·1; H, 5·6; N, 13·5. $C_{12}H_{17}NO.C_6H_3O_7N_3$ requires C, 50·9; H, 5·7; N, 13·2%.

TABLE 2. THE BASIC FRACTION OF THE SEEDS OF EGYPTIAN *Plantago* SPECIES (TWO-DIMENSIONAL CHROMATOGRAPHY ON KIESELGEL GF 254)

Species	Total alkaloids %	Alkaloid number												
		1	2	3	4	5	6	7	8	9	10	11	12	13
P. notata	0·02	+	+	+	+							+		
P. crypsoides	0·01	+	+	+	+	+	+							+
P. coronopus	0·02	+	+											
P. crassifolia	0·02	+	+		+	+					+			+
P. major	0·05	+	+	+	+	+				+	+		+	+
P. albicans	0·04	+	+	+	+	+	+	+	+	+	+	+	+	+
P. cylindrica	0·04	+	+	+	+	+								+
P. ovata	0·06	+	+	+	+	+			+		+			+

1: Base "A."
2: Plantagonine.
3: Base "B."
8: Indicamine.
9: Indicaine.
4, 5, 6, 7, 10, 11, 12 and 13: Unidentified.
Running solvents as in Table 1.

Base B, m.p. 176–178°, λ_{max} (ethanol) 239 mμ. Found: C, 69·9; H, 8·6; N, 10·3. $C_8H_{12}NO$ requires C, 69·6; H, 8·7; N, 10·1%. Picrate m.p. 268–269°. Found: C, 45·9; H, 4·2; N, 15·5. $C_8H_{12}ON.C_6H_3N_3O_7$ requires C, 45·8; H, 4·1; N, 15·3%.

The basic fraction of seven other species has been subjected to two-dimensional thin-layer chromatography with the results shown in Table 2.

References

Ahmed, Z. F., Batanouny, K. H. & Hammouda, F. M. (1965). *Planta Medica*, **12**, 1, 28–38.
Danilova, A. V. & Konovalova, R. A. (1952). *Zhur Obschei Khim.*, **22**, 2237–2239.
Danilova, A. V. (1956). *Ibid.*, **26**, 2069–2071.
Stahl, E. (1958). *Chemiker Ztg.*, **82**, 323.
Sandberg, F. & Michel, K. H. (1962). *Lloydia*, **26**, No. 2, 78–90.
Lee, K. T. (1960). *Nature, Lond.*, **188**, 65–66.