The tetrahydrocannabinol content of cannabis leaf

Korte (1970) examined a number of cannabis plants of different origin and reported that the vegetative parts contained cannabidiol, as the cannabidiol-acid, but not Δ^1-*trans*tetrahydrocannabinol (Δ^1-THC*). Nielsen (1970), however, reported significant amounts of Δ^1-THC in the leaves of mature male and female plants of a South African strain grown in Denmark (1·4 to 12 mg/g dry weight compared with 9·6 to 17·1 mg/g in the flowering tops of female plants). However he used Korte and Sieper's thin-layer chromatographic method of assay (1964) which estimates free THC but not the low R_F value THC-acid (Merkus, 1971). In the fresh plant most of the THC occurs as the acid and this is slowly decarboxylated on storage of harvested plant material, but even after two months at 35° only about one-third is decarboxylated (Yamauchi, Shoyama & others, 1967). It is likely, therefore, that Nielsen's plant material contained significant amounts of the THC-acid, and since smoking converts the latter into THC (Mechoulam, Ben-Zvi & others, 1969), an assay method which includes this acid as well as the free THC should be used. The method of choice is, therefore, gas-liquid chromatography in which the higher temperatures involved simulate the decarboxylating effect of smoking. Kimura & Okamoto (1970) used a g.l.c. method and found up to 12 mg/g dry weight of THC-acid in the vegetative parts.

We have determined the total THC content of plants grown in England, using a g.l.c. method of assay based on that of Lerner (1969). Examination by t.l.c. confirmed that both THC and THC-acid were present in the active samples. The preliminary results are given in Table 1. Although we used the same strain of South African cannabis as Nielsen did, he only found up to 12 mg/g of THC in the leaves of female flowering plants, whereas we found about 33 mg/g (when our results are converted to mg/g dry weight); our higher figures are almost certainly due to the g.l.c. method of estimating both THC and the THC-acid.

Our results therefore confirm those of De Faubert Maunder (1970) that in active strains of cannabis significant amounts of THC occur in the leaves, especially at the flowering stage. The amounts reported in the above investigations vary from about 2 to 30 mg/g dry weight; the figures should be compared with the fact that a marihuana reefer weighs about $\frac{1}{3}$ g and a normal dose of THC would be 5 mg (Isbell, Gorodetzsky & others, 1967).

These figures have important legal consequences as the Dangerous Drugs Act (1965) defines Cannabis as "The flowering or fruiting tops of any plant of the genus

Table 1. *Total* Δ^1-THC *content of cannabis plants grown in England during* 1970.

Strain	Conditions of growth	Total Δ^1-THC content mg/g fresh weight*
(a) South African from UN/S1 Seeds	Greenhouse (vegetative phase)	
	Leaves	5·12
	Out-of-doors (flowering phase) Female plants.	
	Flowering tops	10·15
	Leaves	8·54
(b) Nepalese	Out-of-doors (flowering phase) Female plants	
	Flowering tops	3·40
	Leaves	7·63
(c) Turkish	Greenhouse (vegetative phase)	
	Leaves	traces
(d) English	Greenhouse(vegetative phase)	
	Leaves	0·34

* Values for dry weight approximately 4 × figures given.

Cannabis", implying that only the flowering tops are active. In fact a person using the leaves only would probably have a legally sound defence against prosecution, although, as the above facts indicate, they may contain active material.

We would like to thank the Medical Research Council for a grant towards part of the cost of the work; Dr. R. Mechoulam for a sample of pure THC; Dr. L. D. Kapoor for Nepalese seed and the U.N. Division of Narcotic Drugs for South African seed.

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April 28, 1971

* Numbered Δ^9 according to IUPAC rules.

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Isolation of speciogynine from the leaves of *Mitragyna inermis* (Willd.), O. Kuntze

It was reported by Shellard & Sarpong (1969) that the leaves of *Mitragyna inermis* (Willd), O. Kuntze contained 8 oxindole alkaloids together with the indole alkaloid mitraciliatine and traces of a second indole alkaloid. It was anticipated that this alkaloid might be speciogynine as the alkaloids then isolated would fit into a hypothesis proposed for oxindole biogenesis outlined by these authors. The alkaloid, designated Sp4, was, however, not speciogynine.

We have subsequently isolated from another batch of leaves of *M. inermis* small quantities of indolic substances, one of which is speciogynine. The alkaloids were isolated according to Shellard & Sarpong (1969), Fraction B being subjected to further column chromatography using chloroform–methanol (2:1) and to preparative thin-layer chromatography. Six alkaloidal substances were isolated, one corresponding to mitraciliatine (the bulk of which was in a different fraction), four were present in traces too small to characterize or identify with certainty, and the other was speciogynine. This was identified by comparing the hR_F values obtained on several thin-layer chromatographic systems and its spectral data ultraviolet, infrared and nmr with authentic speciogynine obtained from *Mitragyna speciosa* (Beckett, Shellard & others, 1966).

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April 20, 1971