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TRITERPENE ALCOHOLS IN THE SEEDS OF TWO *CUCUMIS* SPECIES OF CUCURBITACEAE

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Key Word Index—*Cucumis sativus*; *C. melo*; Cucurbitaceae; seeds; triterpene alcohols; isomultiflorenol; multiflorenol; 24-methyl-25(27)-dehydrocycloartanol; 24-methylene-24-dihydrolanosterol; 24-methylene-24-dihydroparkeol.

Abstract—Isomultiflorenol was the major component accompanied by its Δ^7-isomer, multiflorenol, in the triterpene alcohol fractions of the unsaponifiable matter of *Cucumis sativus* and *C. melo* seed lipids. The other triterpene alcohols identified in the seeds were α- and β-amyrins, taraxerol, lupeol, cycloartenol, 24-methylenecycloartanol, 24-methyl-25(27)-dehydrocycloartanol, 24-methylene-24-dihydrolanosterol, 24-methylene-24-dihydroparkeol, euphol and tirucallol.

INTRODUCTION

4-Desmethylsterols [1–3] and 4α-methylsterols [4] in the seeds of some Cucurbitaceae have previously been studied, but no detailed work has been done so far on the triterpene alcohols of Cucurbitaceae seeds. This study was therefore undertaken on the seeds of two *Cucumis* species, *C. sativus* (cucumber) and *C. melo* (melon).

RESULTS AND DISCUSSION

The approximate composition of the triterpene mixtures separated from the seed lipids of *C. sativus* and *C. melo* was determined by GC on an OV-17 glass capillary column (Table 1). The most significant feature is the occurrence of isomultiflorenol (**1**, 5α-multiflorен-8-en-3β-ol) as the predominant component accompanied by its Δ^7-isomer, multiflorenol (**2**, 5α-

Table 1. Approximate composition of triterpene alcohols separated from the unsaponifiable matters of the seed lipids from two *Cucumis* species

Triterpene acetate RR_t*			Composition (%)	
OV-1	OV-17	Compound	*Cucumis sativus*	*Cucumis melo*
1.61	1.73	Isomultiflorenol (**1**)	52	58
1.86	2.13	Multiflorenol (**2**)	5	4
1.64	1.84	α-Amyrin (**3**)	2	3
1.52	1.65	β-Amyrin (**4**)	5	9
1.45	1.57	Taraxerol (**5**)	Trace	1
1.66	1.93	Lupeol (**6**)	Trace	1
1.74	1.86	Cycloartenol (**7**)	10	5
2.01	2.07	24-Methylenecycloartanol (**8**)	13	6
1.95	2.03	24-Methyl-25(27)-dehydrocycloartanol (**9**)†	1	1
1.75	1.76	24-Methylene-24-dihydrolanosterol (**10**)	7	6
1.93	2.00	24-Methylene-24-dihydroparkeol (**11**)	1	1
1.32	1.30	Euphol (**12**)	2	1
1.46	1.47	Tirucallol (**13**)	1	1
		Others, unidentified	1	3

*GC was carried out on OV-1 (260°, splitting ratio 120:1) and on OV-17 (260°, splitting ratio 100:1) SCOT glass capillary columns (30 m × 0.3 mm) and RR_t is given relative to cholesteryl acetate (refer to ref. [15] for detailed GC conditions)
†Most probably cyclolaudenol.

multifloren-7-en-3β-ol). The presence of **1** in *Zanthoxylum decaryi* [5] and *Pelargonium hortorum* [6], and the 3-oxo derivative of **1** in *Cucurbita lundelliana* [7] is already known, whereas the triterpene **2** has so far been detected only in *Gelonium multiflorum* [8] to our knowledge. Although the configuration at C-24 of 24-methyl-25(27)-dehydrocycloartanol (**9**) was not determined, there can be little or no doubt that the compound has the 24β-methyl configuration (i.e. cyclolaudenol), because evidence has been given of the 24β-alkyl configuration for the 24-alkylsterols bearing $\Delta^{25(27)}$-bond in tracheophytes [9]. The occurrence of 24-methylene-24-dihydrolanosterol (**10**) and 24-methylene-24-dihydroparkeol (**11**), double bond isomers of 24-methylenecycloartanol (**8**), in the two *Cucumis* seeds is of interest from the standpoint of sterol biogenesis. Only a few seed-bearing plants are known heretofore to contain **10** [10, 11] and **11** [12–14].

EXPERIMENTAL

The seeds of *C. sativus* and *C. melo* were courteously supplied by Sakata Seeds Co., Yokohama, and the authentic specimen of **2** was generously donated by Professor P. Sengupta, University of Kalyani, Kalyani, India. **1** was prepared from **2** by the double bond migration under the condition of catalytic hydrogenation (PtO_2 catalyst in AcOH) [8]. Origins and systematic names of the other triterpene alcohols used as authentic specimens were described previously [13, 14]. Identification was performed by comparison with authentic specimens of mp, argentic TLC, GC, GC/MS and ^1H NMR spectra for the isolated triterpenes, and of argentic TLC, GC and GC/MS for those not obtained crystalline. Our general techniques have been described in previous articles [13–15].

Si gel TLC of the unsaponifiable matter (15 g) of the lipid (1400 g), extracted from *C. sativus* seeds (8940 g), gave a triterpene alcohol fraction (180 mg) which, after acetylation, was separated into four bands (referred to as bands 1–4 in order of polarity, beginning with the least polar) by argentic TLC. Band 1 gave a mixture of the acetates of **1**, α-amyrin (**3**) and β-amyrin (**4**), from which **1**-acetate, mp 220–223° (lit. [5] mp 217°, [8] mp 227–228°), was isolated by repeated argentic TLC. Band 2 afforded a mixture of the acetates of **1**, **2** and **4**. Repeated argentic TLC of the mixture yielded **2**-acetate, mp 226–227° (lit. [8] mp 227–228°). Band 3 gave a mixture of the acetates of taraxerol (**5**), cycloartenol (**7**), euphol (**12**) and tirucallol (**13**). The fraction from band 4 was separated into three bands on further argentic TLC. Band 4(1) afforded a mixture of the acetates of lupeol (**6**), **9** and **10**. Band 4(2) yielded **8**-acetate, and band 4(3) gave **11**-acetate. Several minor components remained unidentified in the fractions from bands 4 (1–3).

The triterpene alcohol fraction (181 mg) separated from the unsaponifiable matter (10 g) of the lipid (2400 g), which was extracted from *C. melo* seeds (9800 g), was separated into five bands by argentic TLC after acetylation. Band 1 gave a mixture of the acetates of **1**, **3** and **4**, from which **1**-acetate, mp 219–222°, was isolated by repeated argentic TLC. Band 2 afforded a mixture of the acetates of **1**, **2** and **4**, from which **2**-acetate, mp 223–226°, was isolated by repeated argentic TLC. Band 3 afforded **7**-acetate accompanied by the acetates of **5**, **12** and **13**. Band 4 gave a mixture of the acetates of **6** and **9**, and band 5 yielded a mixture of the acetates of **8**, **10** and **11**.

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