FATTY OIL OF SLUG, *INCILLARIA CONFUSA*, AND ITS STEROL COMPONENTS

TATSUO TANAKA and YOSHIYUKI TOYAMA

Department of Applied Chemistry

(Received May 13, 1957)

Regarding the fatty oil of slug, no literature has been known to us. Among terrestrial gastropods, a species of snail, *Arion empiricorum*, was studied on its sterol components by Bock and Wetter[1] who found about 20% of ergosterol together with cholesterol, a di-unsaturated sterol of m.p. 138°C and a mono-unsaturated sterol (sitosterol) of m.p. 138°–139°C in the sterol mixture from this animal. In the present study, characteristics of the fatty oil extracted from the slug, *Incillaria confusa* Cockarell, were determined, and sterol components of this oil were examined. The results of our study show that this oil has a very low iodine value as compared with most oils from aquatic gastropods. The sterol fraction from this oil resembles β-sitosterol in its properties so that the sterol fraction is considered to be composed mainly of β-sitosterol (see Table 1). 5,7-Diene content of this sterol fraction is very small (0.3%). Comparing sterols from slug and sterols from aquatic gastropods, it is noteworthy that both sterols are composed mainly of mono-unsaturated sterols, but the main component of mono-unsaturated sterols from slug is β-sitosterol whereas that from most aquatic gastropods is cholesterol.[2] The mono-unsaturated sterol of m.p. 138°–139°C separated from snail by Bock and Wetter appears possibly to be β-sitosterol.

TABLE 1. β-Sitosterol and Sterol from *Incillaria confusa* together with Sterol from *Arion empiricorum*

	Free sterol		Acetate	
	m.p. (°C)	$[\alpha]_D^\circ$	m.p. (°C)	$[\alpha]_D^\circ$
β-Sitosterol[3]	139–140	−38.0	130 –132	−42.5
β-Sitosterol[4]	136–137	−36.6	125 –126	−41.0
Sterol from *I. confusa*	136–138	−35.7	125.5–127	−41.7
Sterol from *A. empiricorum*[1]	138–139	—	128 –129	—

Experimental

The slug, *Incillaria confusa* Cockarell, used in this study was caught in a forest near Kawagoe City, Saitama-ken in early September, 1955. The living material (160 in number, 256 g.) was killed in boiling water, and then dried at aobut 80°C in an electric oven. The dried material (31 g.) was reduced to powder and then extracted with ether. The ether-extract (2.8 g., 9% on the basis of dried material) was refluxed with about ten times its weight of acetone for a while, the mixture was cooled to the ordinary temperature, the insoluble matter (phospha-

tide) was removed by filtration, and the fatty oil (2.2 g.) was recovered from the acetone filtrate.

The fatty oil was a dark greenish yellow liquid and solidified at the ordinary temperature. It had the following characteristics: n_D^{40} 1.4817, acid value 47.9, saponification value 184.6, iodine value (Wijs) 85.0 and unsaponifiable matter 23.23%.

The fatty acids and unsaponifiable matter were separated from the oil in the usual way. The fatty acids had n_D^{40} 1.4648, neutralization value 202.5 and iodine value (Wijs) 94.7.

The unsaponifiable matter was a mixture of orange-yellow liquid and crystalline solid at the ordinary temperature. The sterol content of the unsaponifiable matter was found to be 37.6% by the digitonide method. For the determination of 5,7-diene ($\Delta^{5,7}$-sterol) in the total sterol, the digitonide obtained in the determination of total sterol was used for ultraviolet absorption measurements in ethanol. The 5,7-diene content of the total sterol was found to be 0.3% assuming the mean molecular weight of sterol to be 415 (molecular weight of $C_{29}H_{50}O$).

The sterol fraction obtained by recrystallization of the unsaponifiable matter from methanol was fine laminae; m.p. 136°–138°C and $[\alpha]_D^{27} = -35.7°$ (in chloroform). The acetate from this sterol fraction was fine plates after recrystallization from methanol; m.p. 125.5°–127°C, $[\alpha]_D^{24} = -41.7°$ (in chloroform) and iodine value (pyridine sulfate dibromide method) 56.9 (calcd. for $C_{31}H_{52}O_2F_1$, 55.6).

Summary

Characteristics of the oil extracted from the slug, *Incillaria confusa* Cockarell, were determined, and the sterol components of oil were examined. This oil had a very low iodine value (85.0) as compared with most oils from aquatic gastropods. The sterol fraction of this oil contained β-sitosterol as its chief component. The 5,7-diene content of sterol fraction was found very small (0.3%).

References

1) F. Bock and F. Wetter: *Z. physiol. Chem.* **256**, 33 (1938).
2) Y. Toyama, T. Tanaka and T. Maeda: *Memoirs Faculty of Engineering, Nagoya Univ.* **7**, 145 (1955).
3) C. A. Kind and V. D. Celentano: *J. Org. Chem.* **18**, 1473 (1953).
4) S. Bernstein and E. S. Wallis: *J. Org. Chem.* **2**, 341 (1937).