

# COMPARATIVE STEROLS COMPOSITION OF THE RED ALGA *ASPARAGOPSIS ARMATA* AND ITS TETRASPOROPHYTE *FALKENBERGIA RUFOLANOSA*

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ABSTRACT.—The sterol content ranged from 0.015% of the dry weight for *Asparagopsis armata* to 0.075% for *Falkenbergia rufolanosa*. Four samples at different reproductive states are analyzed by means of gas-liquid chromatography and gas-liquid chromatography—mass spectrometry. Cholesterol **2** is always the major sterol. In every case two cholesta-diene-diols **8a**, **8b** and two cholestene-diols **5**, **6** have been identified.

The red alga *Asparagopsis armata* Harv. is a dioecious gametophytic plant that alternates in its life cycle with a heteromorphic tetrasporophyte known as *Falkenbergia rufolanosa* (Harv.) Schmitz. The comparative chemical composition of the gametophyte and the tetrasporophyte has been previously reported for halogenated compounds (1). We have now studied the sterol content of some samples of *Asparagopsis armata* and *Falkenbergia rufolanosa* at different reproductive states (table 1).

TABLE 1. *Samples studied for sterols.*

Samples	Date	Reproductive state
A <sub>1</sub>	3rd Mar 1976	<i>Asparagopsis armata</i> young without fructification
A <sub>2</sub>	29th Jun 1976	<i>Asparagopsis armata</i> with fructifications
F <sub>1</sub>	14th Jan 1976	<i>Falkenbergia rufolanosa</i> young without tetraspore
F <sub>2</sub>	20th Dec 1976	<i>Falkenbergia rufolanosa</i> with tetraspores

## MATERIALS AND METHODS

Male and female plants of *Asparagopsis armata*, which were not separated for this investigation, and the asexual *Falkenbergia rufolanosa* were obtained along the Catalan Mediterranean coast near Banyuls-sur-Mer in France. The freshly collected, wet plants were extracted with methanol, chloroform, and ethanol. Solvents were evaporated, and the residues were transferred into ethyl ether to give the lipid oil, which was saponified. Sterols were precipitated from the non-saponifiable fraction with digitonin (2). Further purification was obtained by tlc with pentane-ethyl acetate (7:3 v/v) as eluant. In the same manner as previously described, sterols were identified as their trimethylsilyl ethers by means of gas chromatography-mass spectrometry (gc-ms) technique (3).

Sterol analyses were made on free sterols; a 5% OV-1 column at 280°C was used for quantitative determination (4).

## RESULTS AND DISCUSSION

The tetrasporophyte contains significantly greater concentrations of total sterols than the gametophyte. Their amounts increase during fructification of the gametophyte and slowly decrease during appearance of tetraspores for the sporophytic plant (fig. 1).

Table 1 shows the estimation of each sterol.<sup>1</sup> Cholesterol **2** is the major sterol in all samples analyzed; desmosterol **3** is abundant only for the gametophyte and

<sup>1</sup>For the identification of these sterols by gc-ms, see previous report (4).

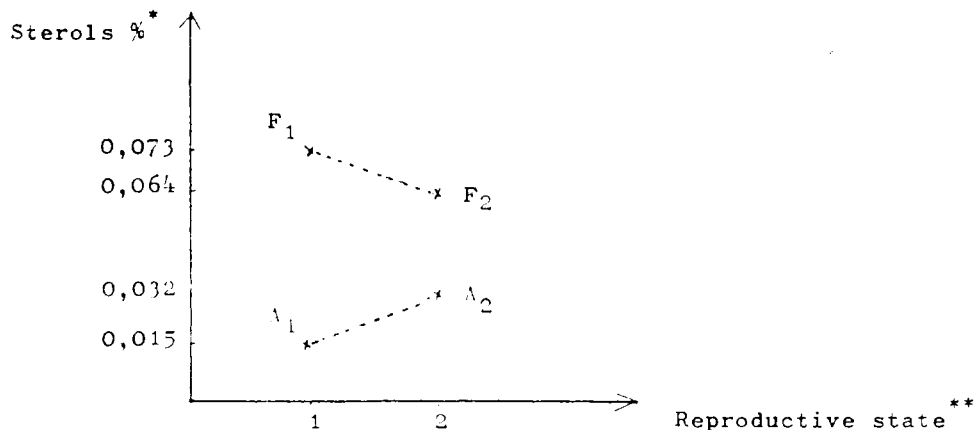


FIGURE 1. Amount of sterols of *Asparagopsis armata* and *Falkenbergia rufolanosa*.

\*Based on dry weight of algae.

\*\*1 sterile plant 2 fructificated plant.

22-dehydro-cholesterol **1** for the sterile *Asparagopsis armata*. The three diols **5**, **6**, **8** are present in both gametophytic and sporophytic plants.

TABLE 2. Estimation of sterols.

Samples	Sterols** identified as % of total sterols analyzed							
	1	2	3	4	5	6	7	8
A <sub>1</sub>	7	70	4	5	4	4	1	4
A <sub>2</sub>	2	84	7	1	2	1	1	2
F <sub>1</sub>	4	81	1	1	5	1	4	3
F <sub>2</sub>	3	84	1	1	6	1	1	3

\*\*1, 22-dehydro-cholesterol; 2, cholesterol; 3, desmosterol; 4, brassicasterol; 5, 25-hydroxy-cholesterol; 6, 25-hydroxy-24-methylcholesterol; 7, fucosterol+ $\beta$  sitosterol; 8a, stigmasterol and 8b, cholesta-5,25-dien-3 $\beta$ ,24-diol (4).

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#### LITERATURE CITED

1. Y. BRUNEAU, L. CODOMIER, G. COMBAUT and J. TESTE, *C. R. Acad. Sc. Paris*, **284D**, 1163 (1977).
2. G. COMBAUT, Y. BRUNEAU, G. JEANTY, C. FRANCISCO, J. TESTE and L. CODOMIER, *Phycologia*, **15**, 275 (1976).
3. C. FRANCISCO, G. COMBAUT, J. TESTE and B. F. MAUME, *Biochem. Biophys. Acta*, **487**, 115 (1977).
4. G. COMBAUT, Y. BRUNEAU, C. FRANCISCO, J. TESTE, L. CODOMIER and M. PROST, To be published.