# SPECTRAL ANALYSIS OF THE CRYSTALLINE STYLE IN SOME INTERTIDAL BIVALVE MOLLUSCS

ABSTRACT

Aqueous homogenates of the crystalline style of bivalve *Anadara rhombea, Crasssostrea madrasensis, Katelysia opima, Meretrix meretrix, Meretrix casta* and *Donax cuneatus* were scanned in both ultraviolet and visible ranges of light spectrum. A prominent peak recorded in the UV range at 275 nm in all species indicated the high protein content of the style. In the visible range three absorption peaks were obtained between 392 nm and 562 nm in all species tested. A major peak recorded at 430 nm was accompanied by two minor peaks. The pattern of absorption spectra in the visible range was in general agreement with the spectrum obtained for carotenoid pigments. The results suggested that carotenoid pigments were present in the style and responsible for the colour of the style.

THE CRYSTALLINE style is a long thin rod of mucoprotein lodged in the midgut of most bivalves and a few gastropods. It aids in the extracellular digestion in the stomach by releasing carbohydrases and lipases (Morton, 1983). Doyle (1966) scanned the aqueous solution of the style of *Mya* in the ultraviolet range of light spectrum and obtained a peak at 280 nm

characteristic of proteins. However, scanning in the visible range was not performed so far in the style of any bivalve species to assess the nature of pigments imparting colour (ranging from yellow to brown) to the style. Yonge (1926) first suggested that the colour of the style was derived from the food sources. Fox (1960, 1966) reported that the carotenoid pigments were the chief contributors to the pigmentation in molluscs. Hence the present work was carried out to study the absorption spectra of the style in ultraviolet and visible ranges and to understand the source of pigments in the style.

The author thanks Dr. AL. Paulpandian for guidance, the Director, C.A.S. in Marine Biology, Parangipettai for facilities and U.G.C., New Delhi for the award of Teacher Fellowship.

*Materials and methods*

Intertidal bivalve species *Anadara rhombea* (Born), *Crassostrea madrasensis* (Preston), *Katelysia opima* (Gmelin), *Meretrix meretrix* (Linnaeus) and *Meretrix casta* (Chemnitz) were collected from the mud flats of intertidal Zone of Vellar Estuary, Porto Novo (11°29'N; 79°46'E) and *Donax cuneatus* (Linnaeus) from Porto Novo sea shore. The crystalline styles were extracted by dissection and the aqueous solutions of the styles prepared by homogenising the style with distilled water. After centrifugation the supernatant was used for scanning. The scanning of the style solution was performed in a Perkin-Elmer (Model 554) UV-VIS Spectrophotometer. The concentration of the style solutions employed for UV scanning was 10 mg/ml and that for visible range scanning was 250 mg/ml.

*Results and discussion*

Scanning of the aqueous homogenate of the bivalve style in the UV range produced a single absorption peak at 275 nm invariably in all species analysed (Figs. 1-6). The prominent peak recorded at 275 nm indicated the high protein content of the styles in bivalve molluscs. A similar spectral property for the style of *Mya* was reported by Doyle (1966).

The visible range scanning produced three absorption peaks between 392 and 562 nm in each species under study (Figs. 7-12). In all species tested, a major peak recorded at 430 nm was accompanied by two minor peaks in *A. rhombea* (392 nm and 562 nm), *K. opima* (392 nm and 546 nm) and in *M. meretrix* and *M. casta* (530 nm and 562 nm). In *C. madrasensis* and *D. cuneatus* the minor peaks were not prominent. The absorption spectra produced by the style solutions in visible scanning was found to be in general agreement with the spectrum obtained for carotenoid pigments. The spectrum of carotenoid is characteristic in having a specific range between 300 nm and 550 nm and a major peak around 450 nm and two minor peaks on either sides (Stegner, 1967). The exact position of the three maxima may vary among the different kind of carotenoids (Harborne, 1973). The results of the present study showed a similar trend. A major peak was invariably present in all species studied around 430 nm. Two minor peaks in *A. rhombea* and *K. opima* (Figs. 7-10) were recorded on either sides of the major peak. However, the minor peaks were shifted to one side in the case of *M. meretrix* and *M. casta* (Figs. 11-12). These spectral properties of the style homogenate suggested that carotenoids were possibly responsible for the colour of the style.

Yonge (1926) reported that the style colour in *Ostrea* was usually yellowish or brown and depended on the nature of food sources. Carotenoid pigments are red, orange and yellow and synthesised by plants. They are the chief contributors to the characteristic pigmentations in molluscs (Fox, 1960). Fox (1960, 1966) reported that the digestive glands

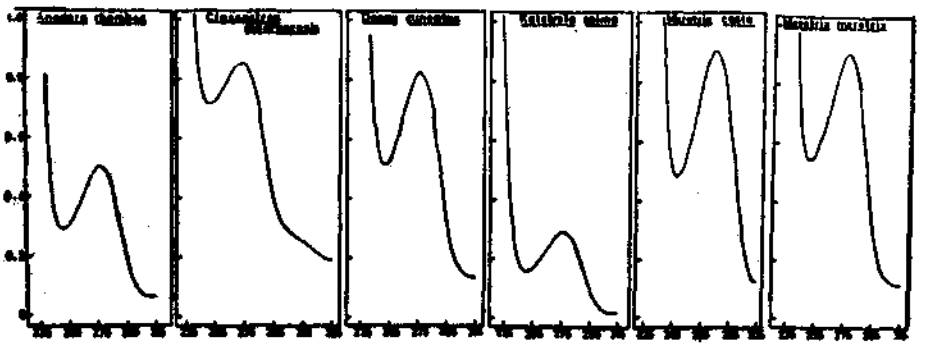

Fig. 1. Absorption spectra of aqueous homogenate of the crystalline styles of bivalve species in the ultraviolet light.

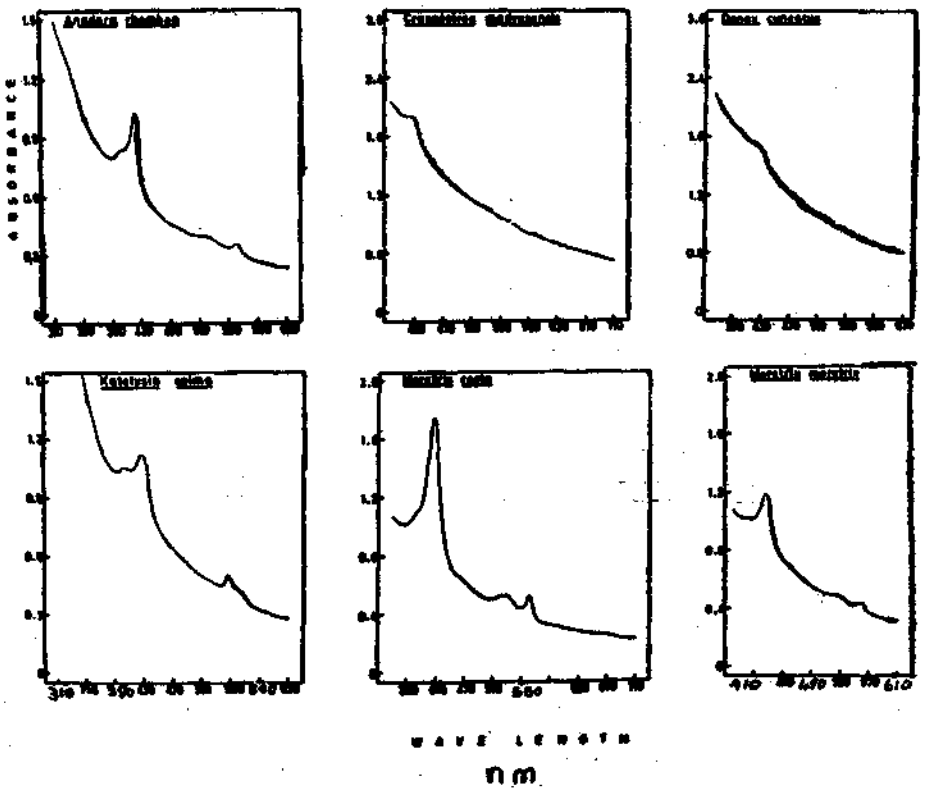


Fig. 2. Absorption spectra of the aqueous homogenate of the crystalline styles of bivalve species in the visible light.

are one of the important tissues in which carotenoids are concentrated giving the glands a characteristic brown colour. Since bivalves feed on suspensions and deposits mostly consisting of phytoplankton and detritus (Crosby and Reid, 1971) and the style colour of the tested species may be obtained from the carotenoid pigments stored in the digestive glands. The pigments are likely to be mobilised into the stomach lumen and then into the style sac through fragmentation spherules containing indigestible waste and some cytoplasm, at the end of the digestive processes (Owen, 1966; Morton, 1973 ; Palmer, 1979).

From the colour and spectral properties of the styles and their disposition in the gut, it is suggested that the colour of the style is due to the carotenoid pigments stored in the digestive glands. However, further work is essential to identify the carotenoid pigments in the style by means of chromatography and visible spectral comparison.

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REFERENCES

CROSBY, W. D. AND G. B. REID 1971. *Can. J. Zool.*, **49** : 617-622.

DOYLE, J. 1966. In : H. Barnes (Ed.) *Some contemporary studies in marine science.* George and Unwin, London. pp. 253-263.

FOX, D. L. 1960. In : M. B. Allen (Ed.) *Comparative biochemistry of Photoreactive system.* Academic Press, New York. pp. 11-31.

——— 1966. In : K. M. Wilbur and C. M. Yonge (Ed.) *Physiology of Mollusca.* Academic Press, New York. Vol. 2. pp. 249-272.

HARBORNE, J. B. 1973. *Photochemical methods.* Chapman and Hall, London, 119 pp.

MORTON, B. S. 1973. *Malacologia*, **14** : 63-79.

——— 1983. In : A. S. M. Saleuddin and Wilbur (Ed.) *The Mollusca.* Academic Press, New York. Vol. 5. pp. 65-147.

OWEN, G. 1966. In : K. M. Wilbur and C. M. Yonge (Ed.) *Physiology of Mollusca* Academic Press, New York. Vol. 2. pp. 53-96.

PALMER, R. E. 1979. *Biol. Bull.*, **156** (1) : 115-129.

STEGNER, R. W. 1967. *Plant pigments.* Rand Mc. Nally and Company, Chicago, 260 pp.

YONGE, C. M. 1926. *J. Mar. Biol. Ass. U. K.* **14** : 295-386.

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