

Taxonomy and distribution of Trichodesmium (Cyanophyceae)
in the upwelling region of NW Africa

by

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1 - Introduction

The planktonic blue-green alga Trichodesmium has a wide distribution in tropical and subtropical waters, and it has been reported by many authors (EHRENBERG, 1830; MOSELEY, 1892; TSUJITA, 1956; DUGDALE, et al, 1961; WOOD, 1963; DUGDALE et al, 1964; MARGALEF, 1965; SMAYDA, 1966; GOERING et al, 1966; NAGASAWA & MARUMO, 1967; TAYLOR et al, 1970; CARPENTER & McCARTHY, 1973; MARGALEF, 1973; HAGUE et al, 1973; MARUMO & ASAOIKA, 1974; MARUMO & NAGASAWA, 1976).

This alga is of particular interest for biological oceanographers since is capable of N_2 fixation, the only processes by which the nitrogen can be introduced into the euphotic zone of ocean. The investigation of productivity, metabolism and distribution of Trichodesmium was carried out in the upwelling region of NW Africa on board the "Cornide de Saavedra" during november 1975. The present paper deals with the taxonomy and distribution of this pelagic blue-green alga and physiological data are unpublished (VALLESPINOS, 1976 manuscript).

2 - Methods

Samples were collected on cruise ATLOR VII; thirty one station were sampled in the upwelling zone of NW Africa (the northern at 22°N and the most southerly at 17°N; Figure 1). Water was taken at surface, 10, 30, 50 and 75 m depth with bottle type Van Dorn, filtering ten liters for a mesh 47 μ m aperture. Immediately after samples were collected they were all fixed by the addition of an aqueous solution of 6 per cent formalin. Filament number of Trichodesmium was counted in the laboratory

and expressed for mm trichome in ten liters of water.

3 - Results and discussion

Two form of Trichodesmium were identified from the studied area. The cells of first form are remarkably elongated, about 3 μm in width and the cell height is 2-3 time as large as width. The trichomes of second form have cells about 6 μm in width and the cell height is 3 μm . The former individuals was found in more abundance than the latter. Filaments identified are as Trichodesmium thiebautii GOMONT. The shape of colony is various, from soft fascicles to sphere. A colony involves 50-100 filaments.

The maximum filament (in mm trichome/ 10 liters water) was 2500 in surface. The densest area was located southward far away from 20°N paralel (see Figure 1). There was not found any filament in the richest area (north Cap Blanc). This distribution pattern of Trichodesmium on November 1975 bears a very close resemblance to that in Setember 1972 (MARGALEF, 1973). According to the data obtained in March 1973, Trichodesmium disappeared in the region upwelling in spring, probably because of the increasing in nutrients or the temperature in surface is too low.

Chlorophyll a content in a colony is 0,03 μg and protein, 0,8 μg . Since chlorophyll a content is low in surface water in november (ESTRADA, in press) a important part of the chlorophyll content in surface water is regarded as having came from Trichodesmium. Such an estimation is also supported by the samll contribution from the diatom standing crop in summer, and also in autu n. Average N_2 fixation for nine stations with the acetylene reduction method was 15 ng N_2 mg protein⁻¹ hour⁻¹ and ranged from 3 at 65; average C fixation was 1,6 μg mg protein⁻¹ hour⁻¹.

Standing crop of Trichodesmium in this area seasonally fluctuates in a wide range. Trichodesmium thiebautii is most abundant from August to November, while is absent in spring. In autumn this area is influenced by Guinean waters in surface: temperature 22-26°C, salinity 35,5-36°/oo and nutrients very low (absents in surface). The most remarkable difference in spring is that tropical water appears displaced southward, out of the studied area, and the Canary current deviates westward having now its limit at 22°W as consequence of an intense upwelling: surface temperature 17-19°C and nitrate more 5 $\mu\text{mol/l}$ (FRAGA & MANRIQUEZ, 1975).

The factors that contribute to blooms of Trichodesmium are not yet known. Recent findings showing that Trichodesmium thrives in nutrient impoverished water and fixes atmospheric nitrogen. In the upwelling region off Africa there are relationships between the presence of Trichodesmium and tropical waters, very poor, in surface. The available information suggests, in conclusion, that the distribution of the Trichodesmium biomass, in the off Africa, is driven by the fluctuation in chemical composition of the sea surface water.

4 - Resumé

Pendant la mission ATLOR VII ont été faits à 31 stations échantillons pour étudier les aspects quantitatifs de Trichodesmium thiebautii. Les distributions montrent une grande densité de filements dans les régions moins fertiles. Cette zone est soumise à des déplacements saisonniers: à la fin de l'été il y a abondance de Trichodesmium et à la fin de l'hiver, à l'époque d'upwelling maximum, cette algue est absente.

7- References

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