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### ON THE DISTRIBUTION OF CHLOROCOCCUM HUMICOLA— AN UNIVERSAL SOIL ALGA IN THE CULTIVATED SOILS OF KARNATAKA STATE (INDIA)<sup>1</sup>

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#### ABSTRACT

Occurrence or otherwise of Chlorococcum humicola in 144 samples of cultivated soils over six Districts of Karnataka State (India), in relation to various factors is discussed. The alga was recorded from soils with significantly higher pH. Soils which recorded the alga did not differ significantly with those soils which did not record the alga, with respect to the chemical properties studied. Among the soil types-Laterites and Black soils favoured occurrence of the alga more, compared to Red Soil types. Among various sources of irrigation-maximum percentage of soils from fields receiving pond water, and minimum percentage of soils from fields receiving well water recorded the alga compared to the soils from fields with stream, river and only rain water. The alga was recorded more frequently from the soils of dry-land cultivation fields, compared to those from wet-land cultivation fields. Present observations support those of others that Chlorococcum humicola is a euterrestrial form.

# INTRODUCTION

Even though there have been a number of reports on the floristic patterns of soil algae from different parts of the world (Metting, 1981), very few attempts have so far been made to study the relation of algal distribution with soil properties, and there appears to have been no report on the soil physiocochemical requirements of specific algae.

Chorococcum humicola a green alga, is reported so far only from terrestrical habitats and is known to be an universal soil alga (Fritsch F. E., 1922—c.f. Shields and Durrell, 1964). Such a wide adaptation of C. humicola is quite interesting, but has not so far been studied in detail.

During a study on soil-algae from Karnataka State Chlorococcum humicola was the most predominant among over 370 algal species recorded from 144 soil samples collected over six Districts (Bongale, 1976; Bongale and Bharati, 1980a). In the present report, an attempt is made to study the distribution of the alga in relation to various factors.

### MATERIAL AND METHODS

A total of 144 samples of cultivated soils from sixteen places over six Districts viz. Dharwad, Belgaum, North Kanara, Raichur, Bellary and Chitradurga were collected and studied in laboratory for their algal flora by enrichment cultures with De's modified Beneck medium at pH 7.0 (Singh, 1961), and for soil physicochemical properties.

Soil samples thus studied were further grouped according to the presence or ab-

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sence of Chlorococcum humicola for the pur- I. Soil physico-chemical pose of present study. Data on soil properties of these two groups of soils was statistically analysed following, "One Criterion of Classification" (Croxton and Cowden, 1955). Further, it was also attempted, to study the occurrence of the alga with respect to different soil types covered (Laterites, Red and Black soils), cropping pattern (dry-land and wet-land cultivation) and the sources of irrigation (such as pond, well, stream, river and only rain water).

#### **OBSERVATIONS AND DISCUSSION**

Among over 370 algal species recorded from the soils under study (Bongale and Bharati, 1980a). Chlorococcum humicola

Soil samples which recorded the alga under study, had significantly higher pH (7.8) compared to those samples which did not record the alga (pH of 7.2). The two soil groups did not differ significantly with respect to other properties studied. Based on the earlier available information (Bongale and Bharati, 1980b; Bongale, 1981), it can be said that soils from coastal areas (Karwar and Panjim) which had lower pH, did not record C. humicola.

#### II. Soil Types (Table II) :

Laterite, Red (red loams, red sandy loams and red gravely loams) and Black (medium black sandy and black clayey)

properties

(Naegeli) Rabenhorst, rated first in the frequency of occurrence, since it was recorded from 86 soil samples out of 144 samples studied. These 86 soil samples which recorded C. humicola represented fifteen places out of sixteen places studied and all the six Districts covered. Out of 16 places of collection, the alga was not recorded only from Karwar, a coastal place in North Kanara District.

soils were covered under the present study. Among these soil types, Chlorococcum humicola was recorded from a minimum percentage of red loamy soils (7 samples out of 17 studied i.e. 41% samples) to most abundant in black clayey soils (8 samples out of 12 studied i.e. 67%samples recorded the alga). Thus it appears that compact to clayey soil structure (as in case of laterites to black

. . TABLE I a second s OCCURRENCE OF Chlorocorcum humicola IN RELATION TO SOIL PHYSICO-CHEMICAL PROPERTIES (% VALUES EXCEPT FOR PH) Number Presence K PO<sub>4</sub> Org.C or Absence of soil  $CO_3$ Na N pН  $\mathbf{Cl}$ Mg Ca of Choloro- samples coccum • • • • Present 0.47 0.0025 86 7.8 0.58 0.029 0.026 0.020 0.092 0.014 0.0006

Absent 58 7.2 0,45 0.0024 0.63 0.025 0.020 0.103 0.014 0.0007 0.029 



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#### TABLE II

#### OCCURRENCE OF Chlorococcum humicola in DIFFERENT SOIL GROUPS

Soil groups		Number of soil samples studied	Soils recording the alga	
			Number of soil samples	Percentage
I. So	il Types			
1.	Laterites	25	16	64
2.	a. Red loams	17	7	41
	b. Red sandy loams	28	18	64
	c. Red gravely loams	4	2	50
3.	a. Medium black sandy	58	36	62
	b. Black clayey	12	8	67

#### II. Major Crops

1. Dry-la	ind	77	55	71
2. Wet-la	und	67	33	49
III. Sources of Irrig	ation			
1. Pond was	er	6	5	83
2. Well wat	er	19	8	42
3. Flowing	water			-
a. Stream	n	. 3	2	- 67
b. Tunga	b <b>hadra r</b> iver	23	15	65
c. Bhadr	a river	8	5	63
4. Only rain	n water	83	53	64

soils) favour the occurrence of Chlorococcum humicola (63% to 64%), compared to more sandy structure (as in case of red soils, 55% of over all red Samples).

#### III. Major Crops (Table II);

Mainly two cropping patterns—the dry-lands (jowar, cotton and wheat) and wet-lands (paddy) were studied in the present investigation. Among these two groups of soils-dry-land soils favoured more the occurrence of the alga, since 71% of thes oil samples belonging of water sources viz., Pond-water, Well-

to dry-land cultivation group recorded the alga, compared to only 49% of the soil samples from wet-land cultivation group studied which recorded the alga. This is probably because of more truely terrestrial conditions prevailing in dryland-fields which naturally would favour the algae adapted to such conditions. This very well supports the view that water, Flowing-water (stream, Tungabhadra, Bhadra rivers) and only rain water were included. Among these, while only42% of the soil samples from the fields receiving well water recorded *Chlorococcum humicola*, a highest member of 83% samples from the fields receiving pond water recorded the alga. Soil samples from fields with supply of stream or river water or rain-fed soils recorded the alga in 63% to 67% of such soils.

In a study by Durrell (1959), Chlorococcum humicola which was recorded from 120 samples, was most frequent out of 85 species of 40 genera recorded from 223 soil samples from Colorado. Among these soils, C.humicola was able to grow and survive at conditions from pH 4.2 to 10. On the basis of his observations on a number of soil types and groups, Durrell (1959) concluded that, little could be drawn from the results except that Chlorococcum humicola and Phormidium tenue were always present while a few other species occurred at random. In another study by Durrell (1962), C. humicola was recorded from 90% of 120 samples from regions around the Gulf of Mexico and areas in Eucador and Columbia. The alga showed no relation to soil type or pH (growing from pH 4.0 to 9.0). Marathe and Ananthani (1972) also recorded C. humicola in the soils from all the six places in Cutch District of Gujarat State (India) which is characterised by extremes of temperature and low humidity. Marathe (1966-67) recorded the alga under report from all the four soils (uncorpped, Bajri, Groundnut and Jowar fileds) of Dhulia in Maharashtra State (India).

ments. It appears to be tolerant to the variations of soil chemical properties studied, at least within the existing range.

While the above reports by other workers indicate that the alga can grow and survive from pH 4.0 to 10.0, studies on the soil samples from coastal areas such as Karwar and Pnnjim did not record C. humicola. It is probable that there may be strain differences within the species and consequently certain strains may be tolerant to a wide range of pH, while others are confined to very narrow range of pH.

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#### support the view that Chlorococcum humicola is a univrversal soil alga. The present data also strongly indicates that this alga is more suited to the terrestrial environ-