mid-derived DNA probes or *yst* (*Yersinia* stable toxin) locus would help in confirming the pathogenic potential of these isolates. The worldwide isolation of biotype 1A *Y. enterocolitica* from human, animals and diverse environments, as well as renewed interest in their pathogenicity, warrant further studies.

M. morganii, regarded as an opportunistic pathogen, is mainly implicated in the urinary tract and wound infections in debilitated post-surgical patients. Among a few reports of its isolation from India, it has been reported from diarrhoeic patients[20], urinary tract stones[21] and even vegetable salads[22]. *M. morganii* subsp. *morganii* (biotype C) are rare[23]. Some of the biochemical characteristics of these isolates, especially indole and methyl red negativity, which have earlier been reported to be positive, were noteworthy. The significance of isolation of *M. morganii* from pork needs to be determined further.

This is the first report of isolation of *Y. enterocolitica* from pork in India. The present study has revealed that it would be worthwhile to further look for *Y. enterocolitica* in pigs slaughtered for pork so that the magnitude of its prevalence may be ascertained.

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I. SINGH
J. S. VIRDI

Department of Microbiology,
University of Delhi South Campus,
Benito Juarez Road,
New Delhi 110 021, India

Cyanobacteria from extreme acidic environments

Cyanobacteria (CB) or blue-green algae are capable of both carbon assimilation and N_2-fixation, thereby enhancing productivity in a variety of environments[1]. Among soil properties, pH is a very important factor in growth, establishment and diversity of CB which have generally been reported to prefer neutral to slightly alkaline pH for optimum growth[2,3]. Acidic soils are therefore one of the stressed environments for these organisms and these are normally absent at pH values below 4 or 5: eukaryotic algae, however, flourish under these conditions[4,5]. There are no reports on the existence of CB below this pH level. The present communication however reports on the occurrence of a wide variety of CB in the extremely acidic soils of Kerala (below pH 4).

Composite samples comprising 10 subsamples each were collected along a transect in the peaty bog lands and adjoining wet paddy fields, potentially acidic areas of Alappuzha district, Kerala. Acid sulphate soils in India are confined to this area and form saline peaty soils locally known as *kari* soils. The development of soil acidity is generally believed to be associated with the base unsaturation caused by leaching out of bases and genesis from base-poor acidic rocks[6]. The dissolved or free acidic substances, such as sulphuric acid and ferric and aluminium sulphate, accentuate acidity in acid sulphate soils[7]. Soil samples were wet or in almost suspension form; pH of the samples was determined using a Systronics

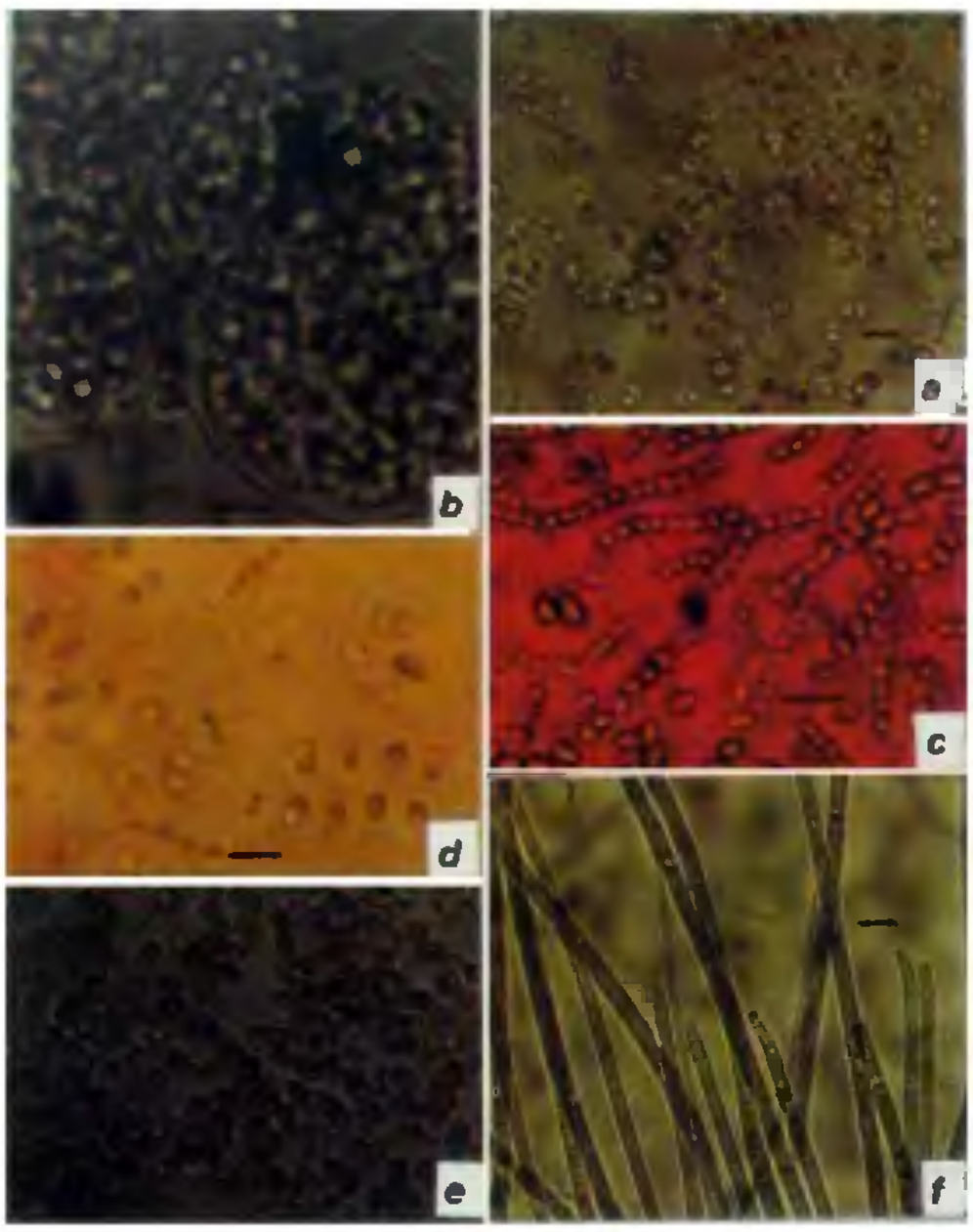

Figure 1. Photomicrographs of some cyanobacteria collected from the soils of Kerala, pH range 4–2.8. *a. Chroococcus pallidus*, *b. Nostoc commune*, *c*, *N. sphaericum*, *d, Gloeothece samoensis* var. *major*, *e*, *Aphanothece stagnina*, *f. Oscillatoria chalybea*. (Scale bar = 10 µm.)

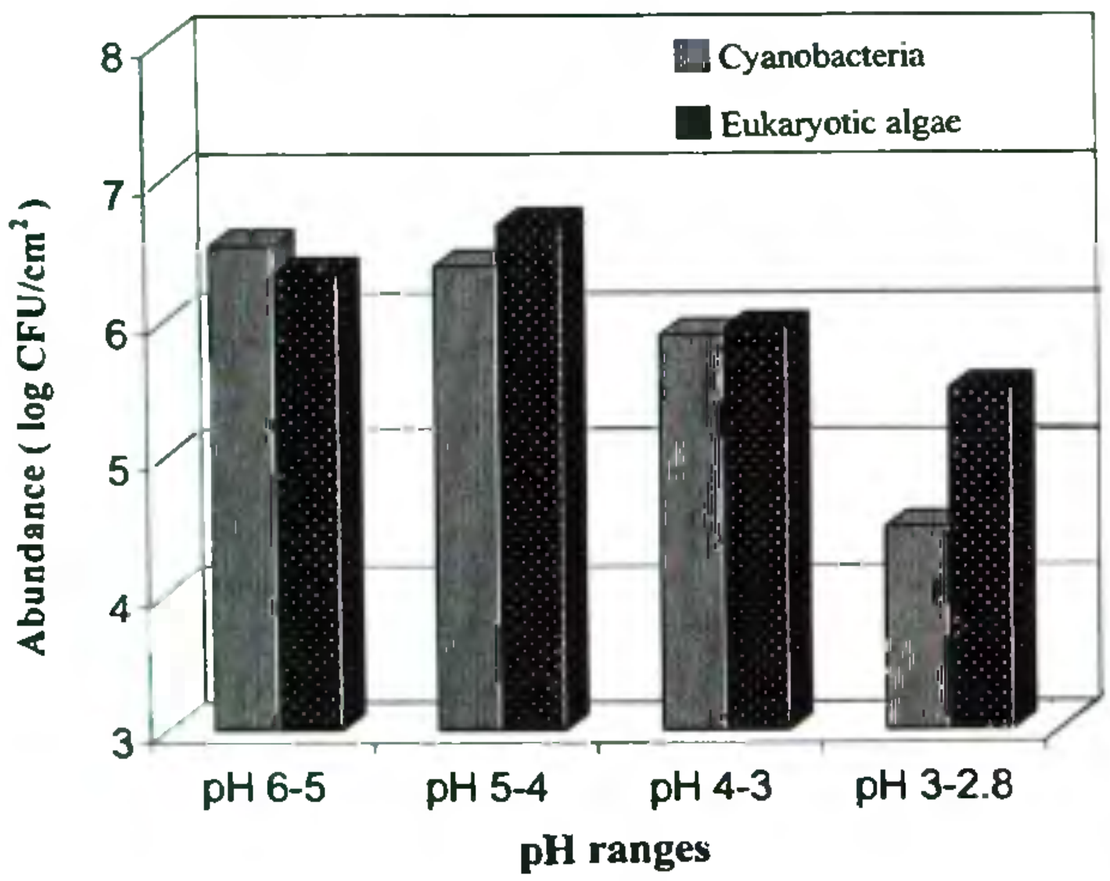

Figure 2. The abundance of cyanobacteria compared to eukaryotic algae in different acidic pH ranges.

pH meter. For CB abundance, samples were divided into four classes based on their pH, viz. 6–5, 5–4, 4–3 and 3–2.8. Serial dilutions were made and one ml each from 10^{-2} to 10^{-6} dilutions was plated in triplicate on to BG-11 medium[8] to count total algae: medium was supplemented with 20 ppm cycloheximide to count the CB[9]. The petri plates were incubated for 3 weeks at laboratory temperature (26 ± 2°C) under continuous light (about 800 lux) provided by white fluorescent light. The colonies were counted under stereo microscope and expressed as colony-forming units per square centimetre (CFU/cm^2) of the area. Visible cyanobacterial colonies were isolated from samples whose pH were below 4, and were identified by referring to standard monograph[10–12].

The abundance of species collected from acidic soils, pH range 4–2.5, are shown in Figure 1. The following species were recorded (those found for the first time in Kerala are marked with asterisk): *Chroococcus pallidus* Nag.*, *Gloeothece samoensis* var. *major* Wille, *Aphanothece grevillei* (Hass.) Rabenh., *Aphanothece stagnina* (Spreng.) A.Br., *Merismopedia punctata* Meyen*, *Microcystis aeruginosa* Kutz., *Cyanosarcina littoralis* Schwab.*, *Oscillatoria animalis* Gom.*, *O. chlorina* Gom.*, *O. chalybea* (Mertens) Gom., *O. princeps* Gom., *Geitlerinema jasorvense* (Vouk.) Anagn.*, *G. claricentrosum* (Gardn.) Anagn.*, *Phormidium foveolarum* (Mont.) Gom., *P. lucidum* Gom.*, *Lyngbya martensiana* Gom.*, *L. stagnina* Kutz., *Symploca parietina* (A.Br.) Gom.*, *Microcoleus lacustris* (Rabenh.) Far., *M. paludosus* (Kutz.) Gom*, *Cylindrospermum stagnale* (Kutz.) Born. et Flah., *Nostoc amplissimum* Setch.*, *N. calcicola* Born. et Flah., *N. carneum* f. *minor* Bharad., *N. commune* Born. et Flah., *N. linckia* (Roth.) Born. et Flah., *N. muscorum* Born. et Flah., *N. punctiforme* (Kutz.) Hariot, *N. sphaericum* Born. et Flah.*, *N. spongiaeformae* Born. et Flah., *Anabaena oscillarioides* Born. et Flah., *A. variabilis* (Bharad.) Fritsch, *Aulosira fertilissima* Ghose, *Scytonematopsis kashyapi* (Bharad.) Geitler, *Scytonema cincinnatum* Born. et Flah.*, *S. simplex* Bharad., *Calothrix braunii* (A.Br.) Born. et Flah.*, *Gloeotrichia intermedia* var. *kanwaensis* Rao*, *Nostochopsis lobatus* Wood*, *Hapalosiphon fontinalis* (Ag.) Born.*, *Westiellopsis prolifica* Janet, *Stigonema dendroideum* Fremy*.

Among the 42 species observed, 19 were recorded for the first time in

Kerala: *Cyanosarcina littoralis* Schwab. is a new record to the Indian subcontinent. A noteworthy feature of the species composition was their highly mucilaginous or ensheathed nature, perhaps an adaptation to the stressed environments. The solitary filamentous and less mucilaginous forms were usually found embedded in the mucilage of other cyanobacterial or eukaryotic algae.

The lowest pH at which CB were found growing was 2.8. Among the 240 composite samples, 68, 89, 65 and 18 respectively were from pH range 6–5, 5–4, 4–3 and 3–2.8. The relative abundance of CB and eukaryotic algae is presented in Figure 2. At pH 6–5, the counts of CB exceed those of eukaryotic algae. Minor variation was observed between the abundance of CB and eukaryotic algae at pH 5–4 and 4–3. However, at extremely low pH range (3–2.8), a major difference was observed in the counts of CB and eukaryotic algae. The lowest count (2.8×10^2 CFU/cm^2) of CB in pH range 3–2.8 was relatively high compared to the abundance in other stressed environments[13].

The available data exhibits the richness of CB in acid soils of Kerala. Several strains isolated from acidic areas have been reported to grow well at pH levels reaching original habitat[14], but the lowest pH was 4.8. However in the present study, cyanobacterial species were observed in samples with pH as low as 2.8. Rapid growth of some strains under laboratory conditions in a medium of low pH has been reported[15], and they maintained a high intracellular pH. This is indicative of an efficient internal pH-regulating mechanism in these rather rare strains.

The availability of certain nutrients, the water holding capacity and other conditions are influenced by high H^+ concentrations[16]. Algal cells are known to develop a certain electrical surface charge expressed as zeta potential[17], depending upon the pH of the surrounding medium, the size of which affects the permeability of the cell wall. Therefore the physiological adaptation of these CB strains towards the H^+ needs thorough investigation at the microenvironment level.

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T. K. DOMINIC
P. V. MADHUSOODANAN

Department of Botany,
University of Calicut,
Calicut 673 635, India

Cost analysis of losses caused by the Malpa landslide in Kumaun Himalaya – A basic framework for risk assessment

Landslides, around the world, take a heavy toll on life and property every year. Indeed, they are one of the most significant contributors to aggregate national losses caused by natural disasters[1], both of property and lives (human as well as live stocks). The monetary costs associated with landslides result from damages to structures, loss of land and the loss of income accruing from the land, and disruption to communication routes. These also include the monetary costs associated with the loss of human and animal life. In the Himalayan region, landslides take place every year, and the nature and the factors, natural or manmade, responsible for generating these landslides are indeed diverse. Thus, the general strategies for hazard estimation do not seem feasible, and each case therefore requires to be studied in detail to work out the total incurred cost associated with landslide damages.

Hill-side instability is a common problem in the geo-dynamically sensitive belts of Kumaun Himalaya[2]. Several major landslides have occurred in the recent past resulting in large-scale damages to life and property. They are generally triggered by the raging torrents of petty streams, bringing enormous volumes of debris mixed with heavy blocks of fallen rocks and boulders that get detached from the constantly strained rock faces along the fault-carved Himalayan valleys[3]. A major tragedy took place on July 22–23, 1983, in the Karmi village, district