LETTERS TO THE EDITORS

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A New Type of Nitrogen-fixing Bacterium

In the course of an investigation in the Jute Agricultural Research Institute on nitrogen transformation in soils cropped with jute, a nitrogen-fixing bacterium has been isolated by the dilution-plate technique. It shows certain morphological and physiological differences from the known non-symbiotic nitrogen-fixing organisms like *Pseudomonas azotocalligans* and those belonging to the Azotobacteriaceae[1]. The cells at first have a coccus-like appearance and occur singly (measuring 0·75–1·0 × 1·5–2·5μ on an average) or as doublets or triplets, gradually changing to rod shape (Fig. 1). The cells are Gram-negative; they contain fat and are very difficult to suspend in water. The optimum temperature for growth was found to be about 28° C. The organism is aerobic, but can be grown under low oxygen tension in Winogradsky's nitrogen-free glucose–phosphate media. It can grow in acidic media also; even at *p*H 4·0 growth was obtained. Bromo-cresol purple milk (skimmed) is turned alkaline and a sediment is formed at the bottom with a clear liquid surface after ten days incubation at 30° C.

Colonies on Ashby's nitrogen-deficient agar are raised, and are usually oval with mean diameters of 4·6 × 3·3 mm.; but some, especially of the larger colonies, may be pulvinate. At first the colonies are transparent with a yellow tinge, but in three or four days they turn chocolate brown and finally become gelatinous. On Winogradsky's glucose peptone agar, colonies appear earlier but grow more slowly than on Ashby's agar. On the former medium the colonies, when young, have chocolate centres and white shiny edges but gradually become grey or colourless. On potato dextrose agar slants, chocolate-brown colonies develop within two days. The pigment does not diffuse into the medium and is insoluble in water and in alcohol. But under low oxygen tension, the colonies appear somewhat like water-drops without any pigment.

The nitrogen fixed in Ashby's nitrogen-free agar–mannitol medium, when estimated by semi-micro-kjeldahl distillation, was found to be nearly 17 mgm. per gm. of mannitol added, and 253 mgm. per 100 gm. of dried medium after incubation for a period of nine days under optimum conditions.

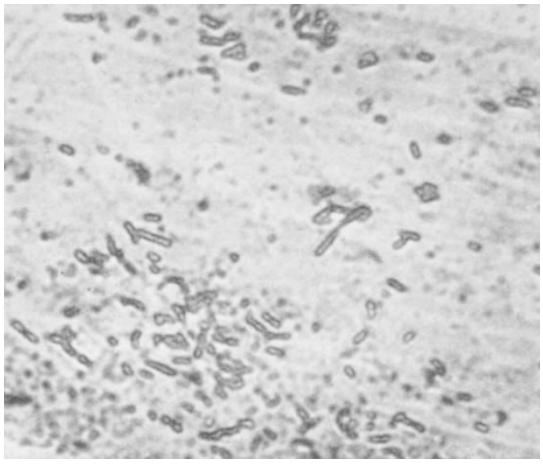

Fig. 1. A new nitrogen-fixing bacterium. × 1,500

Unlike *Azotobacter*, the organism grows in nutrient broth and turns it turbid with a slight yellowish tinge. In nitrogen-free liquid medium, it makes pellicular growth at first and afterwards bulbous gelatinous growth with brown colour; the entire liquid medium becomes jelly-like in about a month. This jelly-like mass, unlike *Pseudomonas azotocalligans*, sticks neither to the side of the flask nor to calcium carbonate at the bottom. If pigmentation does not occur within a week, due to unfavourable growth conditions, no pigmentation develops even on prolonged keeping.

The organism utilizes carbohydrates, especially glucose and mannitol. It has been found that whatever be the source of the energy material, practically no growth is obtained with inorganic nitrogen compounds (either ammonium or nitrates). Further work is in progress.

We thank Dr. B. C. Kundu, director of the Jute Agricultural Research Institute, Barrackpore, for his help during this work.

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[1] Anderson, G. R., *J. Bact.*, **70**, 129 (1955). Jenson, H. L., *Bact. Rev.*, **18**, 195 (1954). Bergy's "Manual of Determinative Bacteriology" (Baillière, Tindall and Cox, 1948).

An Albino Strain of the Desert Locust

During extensive laboratory breeding of the desert locust *Schistocerca gregaria* (Forskål), at the Chemical Defence Experimental Establishment, Porton, twelve albino hoppers (nymphs), creamy-white in colour, occurred among the normal heavily pigmented ones. Six were males and six females, and from them an albino strain has been established in the laboratory of the Anti-Locust Research Centre.

The coloration of normal *Schistocerca* hoppers reared in crowds (phase *gregaria*) consists of a heavy black pattern on a white or yellow ground, while that of young adults is predominantly pink. The pink changes to yellow or straw as the adults become sexually mature. Hoppers of the albino strain reared in crowds, however, do not develop the black pattern, and the adults are almost uniformly ivory-white, becoming yellow on maturation. Goodwin[1] showed that the black pattern of normal *Schistocerca* is due to melanin and the pink colour to insectorubin, and suggested that these two pigments are metabolically interrelated. This suggestion appears to be supported by the apparent absence of melanin from the albino hoppers, although a small amount of insectorubin is present (Goodwin, personal communication).

Schistocerca hoppers reared in isolation (phase *solitaria*) are typically green with little or no black pattern, and they contain neither melanin nor insectorubin[1]. Albino hoppers similarly reared also develop this green colour, without black pattern. Thus, under conditions of isolation, hoppers of the normal and albino strains are indistinguishable.

Nickerson[2] suggested that phase coloration in *Schistocerca gregaria* is controlled by two hormones, one controlling the extent of the black pattern and the other controlling the background colour. He