1. Singer, R., *J. Cramer*, 1975, 915.
2. Pegler, D. N., *Kew Bull.*, 1972, **27**, 155.
3. Manjula, B., *Proc. Indian Acad. Sci. (Plant Sci.)*, 1983, **92**, 81.
4. Ridgway, R., *Colour standard and colour nomenclature*, Washington DC., 1912, p. 43.

EFFECT OF STREPTOMYCIN ON THE MORPHOLOGY OF COWPEA *RHIZOBIUM*

Y. P. DUBEY, R. P. PAREEK and T. A. SINGH
Department of Soil Science, G. B. Pant University of Agriculture and Technology, Pantnagar 263 145, India.

THOUGH much work has been done on antibiotic resistance markers in different *Rhizobium* species[1-3]. Reports on morphological changes after acquisition of antibiotic resistance have been sparse[4]. It has been reported that a *Rhizobium trifolii* strain showed peculiar morphological changes during growth and that the rods changed into a spheroplast-like form[4]. The effect of streptomycin (100 μg/ml) on cowpea *Rhizobium* morphology is reported here.

Young cells of the wild-type parent (control) and mutant (modified, antibiotic-treated) were used for electron microscopic studies. There was shrinkage in both the cell membrane and the nucleus (figure 1). The overall shape of the wild-type cell was ellipsoidal, with a ratio of major to minor axis of 2.4 for cell membrane and 2.8 for the nucleus. The corresponding ratios in the mutant cell were 1.51 (cell membrane) and 1.66 (nucleus). It was also seen that the major and minor axes of the cell membrane were reduced by factors of 2.31 and 1.47 respectively, while major and minor axes of nucleus were reduced by factors of 1.79 and 1.06 respectively. The cell membrane was denser in the mutant cells. The space between nucleus and cell membrane, containing cytoplasm and other organelles, was drastically reduced in the mutant cells. The cell walls, which were less dense but of greater thickness in wild-type cells, were denser and thinner in the mutants. In a number of mutants, they were also fragmented.

The most distinct effect of mutation by streptomycin on cowpea *Rhizobium* was the change in size and shape. This is in agreement with the earlier observation of peculiar morphological changes in

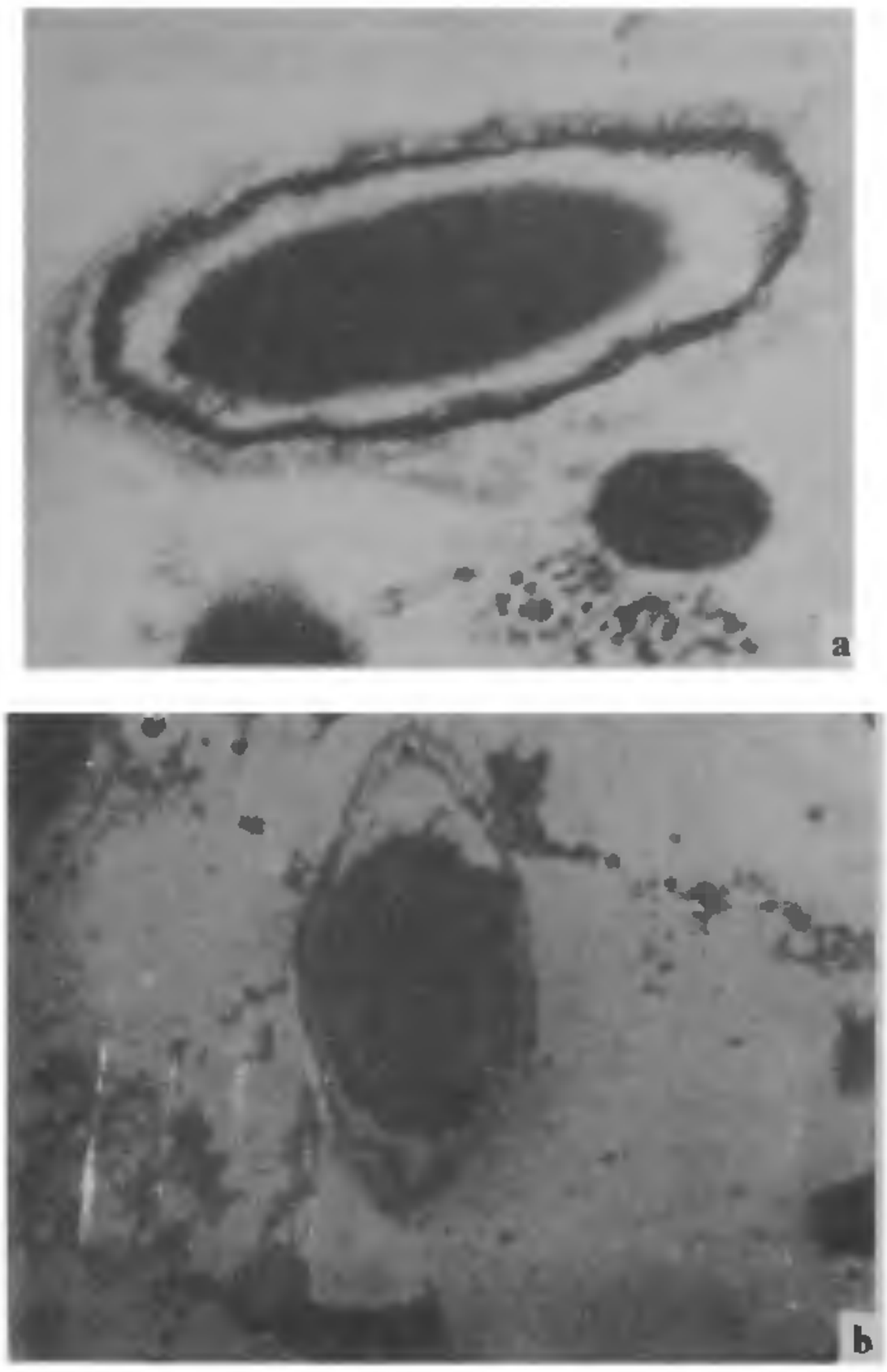

Figure 1a, b. Morphological differences between streptomycin (100 μg/ml) treated mutant (**b**), and wild type mutant (**a**).

Rhizobium trifolii after mutation with high levels (1000 μg/ml) of streptomycin[4].

23 May 1988; Revised 29 July 1988

1. Danso, S. K. A., Habte, M. and Alexander, M., *Can. J. Microbiol.*, 1973, **19**, 1450.
2. Obaton, M., *Bull. Ecol. Res. Commun. (Stockholm)*, 1973, **17**, 170.
3. Schwinghamer, K. A. and Dudman, W. F., *J. Appl. Bacteriol.*, 1973, **36**, 263.
4. Zelazna-Kowalska, *Microbiol. Polonica*, 1973, **26**, 233.