requiring auxotroph isolated by Witkin). The procedures for culture growth, synchronization, radiation exposure, post-irradiation treatment, plating and mutation assay have been described, as have the procedures used for nucleic acid determination[1-3].

The loss of susceptibility of ultra-violet-induced mutations to photoreversal with post-irradiation incubation has been demonstrated with several systems[6-11] and a similar effect with the tryptophan reversion used here has been described[8]. Fig. 1 demonstrates that approximately 20 per cent of the potential mutations lose their capacity to be photoreversed prior to net measurable synthesis of deoxyribonucleic acid in the culture. However, the larger portion of potential mutations lose this capacity in correlation with synthesis of deoxyribonucleic acid. At the time that deoxyribonucleic acid has doubled (70 min.) approximately 80 per cent of the mutations are no longer susceptible to photoreversal.

Two processes may be involved in this loss of susceptibility to photoreversal. The initial process may represent some physical or chemical conversion of the radiation-modified factor responsible for the induction of the mutation to a non-photosensitive state prior to synthesis of deoxyribonucleic acid. However, the loss of susceptibility to photoreversal which is correlated with synthesis of deoxyribonucleic acid would seem to be due to actual synthesis of the mutated gene. These results therefore support the hypothesis that ultra-violet-induced mutation involves finally the synthesis of deoxyribonucleic acid following ultra-violet exposure[5].

These preliminary studies will be reported more fully elsewhere. This research was supported in part by research grant C-3323 from the United States National Institutes of Health and by U.S. Atomic Energy Commission Contract AT-(40-1)-2139.

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SOIL SCIENCE

Symbiotic Nitrogen Fixation in a Grazed Tropical Grass–Legume Pasture

THE importance of legumes as symbiotic nitrogen-fixers in the pastures of temperate regions is generally recognized, and considerable data are available to show the contributions made to the soil nitrogen supply by these legumes. Very little information of this nature, however, is available in the case of legumes growing in tropical pastures. Tropical legumes are often considered to be inefficient nitrogen-fixers; in instances where this is so, it is probable that inoculation with the appropriate *Rhizobium* strain or the supplying of deficient nutrients, or both, will increase fixation efficiency. Results obtained from an experiment on the Faculty of Agriculture Farm, University College, Ibadan, indicate that under suitable conditions the legume in a pasture growing under equatorial conditions may contribute amounts of nitrogen to the soil similar to those added by legumes in temperate pastures.

A grazing experiment comparing the productivity of a pure grass stand (*Cynodon plectostachyum*) and a mixed pasture (*Cynodon plectostachyum–Centrosema pubescens*) was established in mid-1953 and terminated in mid-1958. The soil of the experimental area was a latosol, Ibadan loamy coarse sand. On inspection the roots of the *Centrosema* were found to be well nodulated. The colour of the grass in the mixed pasture was a much darker green than that of the pure grass plot, suggesting that there were significant soil nitrogen differences between these plots. In September 1958 the plots were sampled to a depth of 12 in. and total (Kjeldahl) nitrogen of the samples determined. These nitrogen contents are shown in Table 1; to express the values in lb. per acre it was assumed that an acre-6-in. of soil weighed 2 million lb.

Table 1. SOIL NITROGEN (KJELDAHL) UNDER FIVE-YEAR-OLD GRAZED PURE GRASS AND GRASS–LEGUME PASTURES AT UNIVERSITY COLLEGE, IBADAN, NIGERIA

Depth (in.)	Soil nitrogen under *Cynodon plectostachyum* and *Centrosema pubescens* (lb. per acre)	Soil nitrogen under *Cynodon plectostachyum* (lb. per acre)	Difference in soil nitrogen (lb. per acre)
0–2	770	510	260
2–4	460	370	90
4–8	770	610	160
8–12	600	550	50
0–12 (Total)	2,600	2,040	560*

Each value is the mean of three replicates.
* 't' test: $P = 0{\cdot}10$.

There were 560 lb. of nitrogen per acre-ft. more in the soil under grass–legume than in the soil under grass. This was a net gain over a five-year period and may reasonably be attributed to symbiotic nitrogen fixation by the *Centrosema*. On an average annual basis the *Centrosema* had fixed 112 lb. of nitrogen per acre-ft. Thus the average annual increment of soil nitrogen due to *Centrosema* in this tropical mixed pasture was of the same order of magnitude as those for temperate pasture legumes. For example, Russell[1] states that clovers and lucerne may add to the soil 150–200 lb. of nitrogen per acre per year.

It appears that, under suitable conditions, pasture legumes may play as important a part in the nitrogen economy of tropical soils as they do in the case of temperate soils.

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