

## ABSTRACT

Diversity within and between populations of indigenous rhizobia isolated from cowpeas grown in Jamaica and West Africa were examined in terms of their cultural, serological, biochemical, and genetic characters. Diversity between and within populations of cowpea rhizobia strains isolated from different locations was found in their intrinsic antibiotic resistance pattern, serological relatedness, and cross-nodulation abilities. Uptake of [<sup>3</sup>H]-dihydrostreptomycin in sensitive and resistant strains of cowpea rhizobia was examined to explain one of the possible mechanisms of intrinsic antibiotic resistance. Results indicate that high levels of intrinsic antibiotic resistance were due to decreased permeability causing failure to accumulate the drug.

Protein and DNA restriction patterns showed that each population was unique. Less diversity was found within the populations than between the populations isolated from different locations. A variety of common mutagens were examined for their ability to induce auxotrophic mutants in cowpea rhizobia strains JRC23 and IRC256. While NTG

(N-methyl-N'-nitro-N-nitrosoguanidine), EMS (ethylmethane sulphonate), NA (nitrous acid) and UV (ultraviolet) irradiation were mutagenic with strain JRC23, these mutagenic agents did not mutate strain IRC256. On the contrary, transposon mutagenesis with Tn<sub>5</sub> yielded auxotrophs in strain IRC256 but not in strain JRC23. Symbiotically defective mutants of cowpea rhizobia strain IRC256 were isolated by random Tn<sub>5</sub> mutagenesis and characterized. DNA hybridization of total DNA from a representative number of Tn<sub>5</sub> mutants showed that each of them had one copy of the transposon Tn<sub>5</sub> which was randomly inserted into the genome of cowpea rhizobia. R-plasmids RP4 and its derivative R68.45 were transferred from Escherichia coli to two cowpea rhizobia strains JRC23-SM20 and IRC256-HA409. The transfer of plasmid RP4 to cowpea rhizobia was 1,000-fold higher than transfer frequency of R68.45. The transconjugants were further used to transfer R-plasmids within (isogenic) and between (non-isogenic) cowpea rhizobia strains. The plasmid transfer frequency was higher in isogenic than non-isogenic strains. The ability of R-plasmids to mobilize chromosomal genes in cowpea rhizobia was also examined. R-plasmids mediated chromosomal transfer; however, mobilization

of chromosomal markers  $Sm^R$  and  $Met^+$  by RP4 in isogenic strains was more efficient than by R68.45. Chromosomal mobilization has not previously been reported in cowpea rhizobia.