

EVALUATION OF THE RHIZOBIUM-SUBTERRANEAN CLOVER SYMBIOSIS AND ECOLOGY OF RHIZOBIUM IN LIGNITE MINE SPOIL

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Lignite mine spoils in Texas are commonly revegetated with coastal bermudagrass (Cynodon dactylon L.). Clovers have been utilized in reclamation programs, but information regarding their establishment and persistence in mine spoil is limited. Field, greenhouse, and laboratory studies were conducted to investigate the Rhizobium-subterranean clover (Trifolium subterraneum L.; subclover) symbiosis in mine spoil.

Subclover was broadcast seeded into a six-month-old bermuda-grass sod. Plots were fertilized with 336 kg ha⁻¹ of 17-17-17 or 0-17-17 or left unfertilized at the onset of each clover season. All plots were fertilized with 336 kg ha⁻¹ of 17-17-17 at the beginning of each grass season.

Although low numbers (0 to 10² g⁻¹) of native rhizobia were present in fieldplots, inoculation with a commercial, multi-strain inoculant increased biomass production (100%) and total N and P yields of subclover in the early portion of the first season. Yields from inoculated and uninoculated plots were generally comparable later in the first season and in the second year. Subclover production in the field was increased by P-K fertilization, whereas addition of N with P and K did not affect production. In pot studies, clover production was increased by P rates of 40 to 80 mg kg⁻¹.

The presence of subclover prior to bermudagrass increased grass production (50%) and total N and P yields later in the first year and in the second season. Concentrations of N and P in the grass were increased when subclover was an antecedent crop. Fertilization of clover with N and P increased grass yields (25 to 50%), indicating that levels of both nutrients in spoil were insufficient for grass production.

Introduced and native rhizobia maintained sufficient levels (10³ to 10⁴ g⁻¹) to nodulate emerging clover in subsequent years. The percentages of total numbers of effective rhizobia were lowest when subclover was absent, and percentages increased when subclover was introduced at a site.

Survival of individual strains of Rhizobium was evaluated using the enzyme-linked immunosorbent assay (ELISA). After two years, strains 162x97 (subclover inoculant) and 162K10 (crimson clover inoculant) codominated in the spoil. The relative abundances of these strains were generally similar to those observed on the older, reclaimed sites planted with inoculated subclover in 1981.

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