

ABSTRACT

Some Factors Affecting Symbiotic Nitrogen Fixation and Yield of Cowpea [Vigna unguiculata (L.) Walp.] Cultivars

Dulcie May Linton

Symbiotic nitrogen-fixation by cowpea [Vigna unguiculata (L.) Walp.] is an important factor determining yield in this crop which is becoming a major source of protein in the diets of people in the tropics. Symbiotic nitrogen fixation could also be effective in reducing the widespread use of expensive nitrogen fertilizers by developing countries. A study was conducted to determine the effects of certain microelements, phosphorus and pH on the growth, nodulation and nitrogen fixation of three important cultivars of this tropical plant.

The beneficial effects of phosphorus were demonstrated in greenhouse experiments with cowpea cultivars VITA-3 and Pinkeye Purplehull. The soil used in field experiments contained sufficient phosphorus (45-60ppm), so that addition of phosphorus did not result in any positive increases in yield and yield parameters.

All the trace elements, with the exception of

manganese, had positive effects on growth and nodulation of the cowpea cultivars. Boron was most effective in the range 0.1-10ppm; copper produced marginal increases at the 0.5ppm level; molybdenum was most effective in the 0.5-10ppm range and zinc within the 5-20ppm range. Manganese application had a negative effect on the growth, dry matter accumulation, and nodulation.

In field experiments with cultivars VITA-3 and Laura-B, the residual soil levels of manganese and zinc were sufficiently high to produce favourable growth and yield. Addition of 5kg/ha of manganese or zinc had only a slight beneficial effect and further additions were detrimental to yields.

The addition of calcium carbonate to acid soil (pH 4.5) in pots, resulted in positive increases in growth, dry matter accumulation, nodulation and nitrogen fixation of the cowpea genotypes VITA-3 and Pinkeye Purplehull. However, because of the initial high levels of calcium in the soil used in the experiments (465ppm), plants in control were green and well nodulated even at the low pH.