

2.2.3



Sihlongonyane, Raphael. (1998). The role of vesicular arbuscular mycorrhizae fungi on the growth and nutrient uptake by bambarra groundnut (*Vigna subterranea* (L.) Verdec.). (Supervisors: Dr. O. M. Lungu and Mr. R. Nyemba).

A study was carried out at the University of Zambia, School of Agricultural Sciences between September and November 1997. The objective of the study was to evaluate the effect of VAM fungi on growth and nutrient uptake by bambarra groundnut. The experiment was arranged in a split plot design factorial combination of mycorrhizal inoculation (400g inoculums per pot) and phosphorus fertilizer rates (0, 4, 8 and 16kg P/ha) applied as KH_2PO_4 . Mycorrhizal inoculation and phosphorus rates were taken as sub and main factors, respectively with five replications. A second experiment was set up to investigate the effect of inoculums on plant growth and nutrient uptake. The experiment was arranged in a Completely Randomized Design (CRD), and the treatments replicated five times were 0, 200 and 400g inoculums per pot. The accession of bambarra groundnut planted was ZVS30, chosen on the basis of early maturity. The parameters measured were number of nodules, dry matter yield and uptake of N, P and K. Inoculation with mycorrhizal fungi increased dry matter yield, nodulation and uptake of P and N. Phosphorus uptake in shoot and whole plant increased by 27 and 25%, respectively in inoculated plants compared to non-inoculated plants. Mycorrhizal inoculation resulted in 28% increase in root nodulation as well as in increase in N uptake in the shoots (41%), root (36%) and whole plant (39%). Only K uptake in root was significantly increased (23%) by mycorrhizal inoculation, but there was no apparent increase in K uptake in the shoots and whole plant. Mycorrhizal

inoculation resulted in increase in dry matter yield of shoot (39%), root (35%) and whole plant (39%) compared to non-inoculated plants. Addition of phosphorus fertilizer up to 8kg P/ha increased the uptake of K in shoot and whole plant by 66% and 59%, respectively. Above this rate, there was no further increase. The number of nodules per plant was also increased by 57% as the phosphorus fertilization rates increased up to 8kg P/ha beyond which there was no apparent increase. Both inoculated and non-inoculated plants responded to phosphorus fertilization. Inoculation with mycorrhizal fungi alone had more effect on N uptake in roots and root dry matter yield of bambarra groundnut than phosphorus fertilization or the interaction between mycorrhizal fungi and increasing rates of phosphorus fertilization. Conversely, the interaction between mycorrhizal fungi and increasing rates of phosphorus resulted in greater K uptake in the roots of bambarra groundnut than was obtained by mycorrhizal fungi or rates of phosphorus fertilization independently. The rates of 200 and 400g inoculums per pot had the same effect on dry matter yield, nodulation, uptake of N, P and K by bambarra groundnuts. This research has demonstrated that inoculation of bambarra groundnut with mycorrhizal fungi increases dry matter yield and uptake of N and P.