ABSTRACT

Grain legumes are used widely in intercropping systems. However, quantitative and comparative data available on their N_2 fixation and N beneficial effect on the companion crop in intercropping systems are scarce. Hence, studies were conducted to ascertain the above when cowpea (Vigna unguiculata (L.) Walp), mungbean (Vigna radiata L.) and groundnut (Arachis hypogaea L.) were intercropped with maize (Zea mays L.). Attempts were also made to investigate the effect of K on the competitive ability of grain legumes in legume+cereal intercropping systems.

The first experiment was aimed at ascertaining the effects of K application on the growth and N-fixation of groundnut (cv. No.45), when intercropped with maize (cv. Badra). The study was conducted in basins (30 liters), at three K levels viz. 0, 20 and 40 mg K/kg of soil. The soil used was tagged by incorporating ^{15}N-labelled plant material. When grown as a monocrop, K had no effect on the per cent N derived from atmosphere, amount of N_2 fixed, dry matter production, pod yield and total N content of groundnut. However, when intercropped with maize, lack of K application affected the above parameters significantly which was overcome by improving K level. Thus, the optimum level of K for groundnut was greater when intercropped than monocropped. There were evidence for possible interactions between K level and cropping system, with regard to N_2 fixation, pod yield and total dry matter production of groundnut. Intercrop maize derived 30-35% of its N content from the associated groundnut plants which amounted to 13-22 mg N/plant. The amount of N supplied by groundnut to associated maize plant was not affected by K level. It appears that there is a scope for alleviating growth depression of legume component in

legume-cereal intercropping systems by developing appropriate K fertilizer practices.

The second experiment was ^{15}N-aided and done outdoors in basins at two locations. ^{15}N labelling was done either by incorporating ^{15}N-tagged plant material or by applying ^{15}N-labelled fertilizer along with sucrose. Intercropped groundnut fixed the highest amount of nitrogen from the atmosphere (i.e. 552 mg plant^{-1}), deriving 85% of its N from the atmosphere. Intercropped cowpea and mungbean fixed 161 and 197 mg N plant^{-1}, obtaining 81% and 78% of their N content from the atmosphere, respectively. The proportion of N derived by maize from the associated legume varied from 7-11% for mungbean, 11-20% for cowpea and 12-26% for groundnut which amounted to about 19-22, 29-45 and 33-60 mg N maize plant^{-1}, respectively. The high nitrogen fixation potential of groundnut in duel stand and its relatively low harvest index for N have apparently contributed to greater N-beneficial effects on the associated crop.

The third experiment, which was planned for monitoring the time course of nitrogen fixation/nitrogen transfer in groundnut and cowpea in maize based intercropping systems, in two potassium regimes. This ^{15}N-aided study was carried out in the dry zone, in similar type of basins used previously. Estimates were made on 30, 60 and 76 DAP (Days After Planting) for both legume and non-legume components. Groundnut fixed more nitrogen than cowpea at all three samplings. K application had no significant effect on the amount of nitrogen fixed by legumes at final harvest. Intercropping has resulted in a significant increase in dry matter yield, nitrogen yield and amount of nitrogen fixed by both legumes. A tendency to increase the nitrogen transfer from legume to companion crop was evident from 60 - 76 DAP. At the final harvest, groundnut fixed higher amount

of nitrogen (677mg plant^{-1}), however, less amount was transferred to maize (33mg plant^{-1} or 5% of groundnut nitrogen) compared to cowpea which fixed less amount of N (348mg plant^{-1}) and transferred more (48mg plant^{-1} or 16% or 19% of cowpea nitrogen) at K_{60}. Intercropping significantly increased the nitrogen yield of maize except for maize in maize+cowpea mixture at K_{20}. The peak nitrogen fixation was observed to be around 60 DAP for both legumes.