FECHT-CHRISTOFFERS, M.M., HORST, W.J. (2005): Does apoplastic ascorbic acid enhance manganese tolerance of Vigna unguiculata and Phaseolus vulgaris?. J. Plant Nutr. Soil Sci. (in press).

SUMMARY

In cowpea (*Vigna unguiculata*), the development of manganese (Mn) toxicity is considered to be accompanied by the formation of reactive oxygen species, oxidized Mn and phenoxy radicals in the leaf apoplast. Ascorbic acid (AA) is a common antioxidant in plants and the oxidation of AA particularly in the leaf apoplast contributes to the first line of defence against several biotic and abiotic stress factors. The objective of the present study was to contribute to a better understanding of the role of AA in Mn leaf-tissue tolerance of cowpea and common bean (*Phaseolus vulgaris*). Five cowpea cultivars (cvs) differed greatly in Mn tolerance which was expressed in differences in numbers of brown spots on leaves and in peroxidase (POD) activity in the apoplastic washing fluid (AWF). In a Mn-sensitive cv, after 3 days of Mn treatment, brown spots were formed and POD activities were increased, accompanied by a release of proteins into the apoplast. In the AWF the concentration of AA and the ratio of AA/(AA+DHA) decreased already after one day to only 2% after 3 days. In the leaf tissue the ratio was nearly unaffected and the total AA+DHA content in the leaf tissue was even increased with advanced expression of Mn toxicity. The application of AA solutions in the range of 5-10 µM via the petiole slightly enhanced Mn tolerance as indicated by the reduction of brown spots (however inconsistently) and POD activity (consistently) in the AWF. Common bean cultivars differing in ozone tolerance which has been reported to be due to a high AA availability in the leaf apoplast were studied for their Mn tolerance. Clear differences in Mn tolerance between the cultivars existed, however, these differences were not related to their ozone tolerance. From these results we conclude that the maintenance of sufficient AA levels in the leaf apoplast contribute to Mn tolerance, but does not fully explain genotypic differences in Mn tolerance in cowpea and common bean.