

11 Studies on Nitrate Reductase and Nitrate Reductase  
Inhibiting Enzyme in field-grown finger millet  
(*Eleusine coracana* (L.) Gaertn.) 11

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A thesis submitted in partial fulfilment for the  
degree of Master of Science in Botany (Plant Physiology  
and Biochemistry) of the University of Nairobi.


1992


DECLARATION

I declare this thesis a result of my original work and has not been submitted for a degree in any other university.

DAVID MISIKOH WATIMAH  6/2/1992.  
Signature date

This thesis has been submitted for examination with our approval as University supervisors.

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### ABSTRACT

The induction of NRA by nitrate has been demonstrated in various plants under strictly controlled conditions. When nitrate supply is limited, NRA is almost undetectable in the majority of the plants. This has led to the conclusion that nitrate is the main inducer of NRA. On the other hand, NRIE activity has not been shown to respond similarly towards nitrate. The conclusion has therefore been that NRIE is essentially a constitutive enzyme.

In this study, the influence of nitrogenous fertiliser on NR and NRIE activities was investigated. Nitrate reductase and nitrate reductase inhibiting enzyme activities were assayed both from leaf and root tissues. The activities of both enzymes were not significantly influenced by these fertilisers in terms of overall activity. The fertiliser's influence on NRA was significant during the sixth, eighth and tenth weeks of development. At the same time, NRA was significantly higher in the leaves than roots regardless of treatment. This stage was also marked by the flowering of the crop.

On the other hand, fertiliser N had no significant effect on NRIE activity throughout the study period except in the root tissue during the tenth week of development. The inhibiting enzyme activity was significantly higher in the roots than leaves on the overall observation.

Nitrate reductase activity increased gradually during the first eight weeks of development. It declined continuously over the rest of the the study period. Nitrate reductase inhibiting enzyme activity also increased in the first eight to ten weeks and subsequently declined. Tissue protein levels followed the same trend. However, tissue nitrate content continued to increase throughout the study period.

These findings suggest the existence of a relationship between the plant's physiological state and its response to the applied fertiliser N. It may be argued that finger millet requires little nitrogen during its early stages of development. Its capacity of assimilating nitrogen seems to increase gradually and reaches maximum at, or near the flowering period. It may, therefore, be recommended that application of nitrogen fertilisers to the field-grown crop of finger millet be minimal until the flowering period is approached or even limited to this stage of development.

However, there is need for further research to ascertain the general nutritional requirements of finger millet in order to meaningfully utilise these findings. With such information, the common wasteful application of fertilisers and imminent environmental pollution may be substantially reduced. This may be achieved either by reducing the rates of application or by limiting the application to periods of greatest demand for the nutrients.