DECLARATION

I, Simphiwe Mhlontlo, hereby declare that this dissertation is the result of my own original work, unless where specifically indicated in the text, and acknowledgement is made to the work of others.

Dated……………this day of……………2008

Signed ………………………

S. Mhlontlo

Place: University of Fort Hare, Alice
DEDICATION

This work is dedicated to my parents Chaplain Luvuyo and Virginia Ntombikayise Mhlontlo.
“Because of what you have done, the ground will be under curse. You will have to work hard all your life to make it produce enough food for you. It will produce weeds and thorns, and you will have to eat wild plants”

Genesis 3: 17-18 (Today’s English Version)
ABSTRACT

*Amaranthus* is among the nutritious indigenous plant species that are gathered from the wild in the Eastern Cape to prepare a traditional meal known as ‘imifino’ or ‘isigwampa’ to supplement the necessary proteins, vitamins and minerals which are poor in maize-based meals. *Amaranthus* species are adapted to wild conditions unsuitable for exotic vegetables and could be cultivated but information on its fertility requirements, as sole or intercrop, is the key for its domestication and production as a leafy vegetable, particularly where manure is used. Two dry-land and one glasshouse experiments were conducted to study the effects of sheep kraal manure application rate, intercropping with maize and soil type on growth, fresh and dry matter yields, nutrient uptake and grain yield of a local *Amaranthus* accession that grows wild in the Eastern Cape. Sheep kraal manure rates ranging from 0 to 10 t ha\(^{-1}\) and an NPK {2:3:4(30) + 0.5% Zn} fertilizer as a positive control, applied at rates recommended for spinach, were tested.

In the Gqumahashe experiment, where *Amaranthus* was grown as a sole crop, low manure rates (≤ 2.5 t ha\(^{-1}\)) resulted in plant heights and fresh matter yields which were comparable to those in the unfertilized control, whereas higher rates (5 and 10 t ha\(^{-1}\)) and recommended NPK fertilizer had higher levels both at 30 and 60 days after transplanting (DAT) at \(p < 0.05\). At 30 DAT, manure application rates of ≥ 2.5 t ha\(^{-1}\) and the NPK fertilizer treatment, produced greater shoot dry-matter yields (29.35, 30.75 and 37.68 g plant\(^{-1}\)) than the unfertilized control (17.11 g plant\(^{-1}\)) at \(p < 0.05\). Uptake of N and P in the leaves increased with increase in manure application rate with N uptake reaching a maximum (308 mg plant\(^{-1}\)) at a manure rate of 2.5 t ha\(^{-1}\) which corresponded with the maximum dry matter yield. There was no effect of manure rate or fertilizer on residual soil N and Ca, whereas P, K, Mg and Zn increased.

In a pot experiment with soils from Ntselamanzi and Gqumahashe Villages, manure rates ≥ 2.5 t ha\(^{-1}\) resulted in plant heights and fresh matter yield that compared well with the NPK fertilizer treatment in the Gqumahashe soil whereas only the 10 t ha\(^{-1}\) manure treatment was comparable to the NPK fertilizer treatment in the Ntselamanzi soil. Only
treatments with $\geq 5$ t ha$^{-1}$ manure had stem girth (1.00 and 1.07 cm) that compared well to NPK fertilizer (1.03 cm) in the Ntselamanzi soil whereas in the Gqumahashe soil, all manure levels compared well to NPK fertilizer (1.02 cm). However, no significant difference was observed in plant height and stem girth and fresh matter due to soil type. In both soils, the 1.3-10 t ha$^{-1}$ manure treatments had dry leaf weight comparable to plants fertilized with NPK fertilizer (3.72 g plant$^{-1}$ for the Ntselamanzi soil and 3.65 g plant$^{-1}$ for the Gqumahashe soil) and were bigger than the unfertilized control (2.2 g plant$^{-1}$ for the Ntselamanzi soil and 1.38 g plant$^{-1}$ for the Gqumahashe soil) at $p < 0.05$.

Uptake of N, P and K increased as result of manure application but nonetheless, it was less when compared to plants fertilized with NPK fertilizer in both soils.

In a field intercropping experiment carried out at Ntselamanzi, growth and yield of sole and intercropped Amaranthus plants grown with manure improved when compared to the unfertilized control and compared well to NPK fertilizer. At 30 days after transplanting (DAT), both sole and intercropped plants grown with $\geq 2.5$ t ha$^{-1}$ manure had fresh and dry matter yield comparable to plants fertilized with NPK fertilizer. At 60 DAT, intercropped plants grown with all manure levels had bigger fresh matter yield when compared to unfertilized control (836.0 g plant$^{-1}$) whereas for sole cropped plants only those grown with $\geq 2.5$ t ha$^{-1}$ compared to NPK fertilizer (1467.7 g plant$^{-1}$) at $p < 0.05$. Uptake of N, P, K, Ca and Mg increased with increase in manure application in both sole and intercropped Amaranthus. Whereas Amaranthus did not suffer from the competition in the intercrop, maize biomass and grain yield were severely reduced with the effects being evident after 60 DAT. Based on results of this study, it is therefore suggested that, if Amaranthus is to be intercropped with maize under dry land conditions of the Central Region of the Eastern Cape, sheep manure should at least be applied at rate of $\geq 2.5$ t ha$^{-1}$ and Amaranthus be harvested at 30 DAT.

**Keywords:** Amaranthus accession, dry matter, intercropping, maize grain yield, nutrient composition, residual soil nutrients, sheep kraal manure
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