CONTRIBUTION OF NITROGEN TO SOIL FERTILITY, PRODUCTION OF INDIGENOUS UNDERUTILIZED VEGETABLES AND FOOD SECURITY IN SOUTHWEST NIGERIA

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Background

With increasing adverse impacts of climate change in Africa and other parts of the world, a total of 842 million people in 2011-13 were estimated to be suffering from chronic hunger and two hundred million of these people were in Africa (FAO, 2014). The indigenous underutilized vegetables of Africa have high potential to reduce malnutrition. The indigenous underutilized vegetables of southwest region of Nigeria which are collected wild as weeds, are gradually disappearing due to rapid growing demand for high valued food (Plate 1). Nitrogen is the most limiting crop nutrient for *Solanum macrocarpon (Igbagba)* (Plate 1) and *Solanum scabrum (Ogunmo)* production (Plate 2). This study aimed to examine the soil fertility status, yield and quality of *Solanum macrocarpon* and *Solanum scabrum* under urea nitrogen application in different agro ecological zones of southwest Nigeria.

Area of study

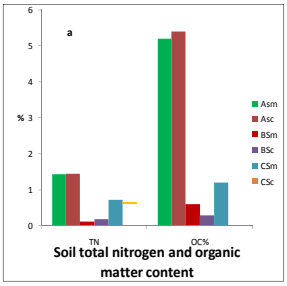
The study was carried out in Iwaro-Oka , Ondo State and Ogbomosho, Oyo State (Derived savannah) and Ile-Ife, Osun States (Rain forest) of southwest Nigeria in 2013. The study was part of the Nigerian-Canadian Vegetable project sponsored by the International Development Research Center (IDRC) & Foreign Affairs, Trade and Development Canada (FATDC) project number 106511 (www.nicanveg.org). Iwaro-Oka lies at Latitude 07^0 25' 25.99" N and Longitude 05^0 46' 29.14" E, Ogbomosho at Latitude 08^0 6' 32.0" N and Longitude 04^0 18' 29.8" E and Ile-Ife at Latitude 07^0 27' 24.39" N and Longitude 04^0 33' 16.14" E (Plate 3). The experiment was arranged into a Completely Randomized Design with N at 0, 40, 80 and 160 $kgha^{-1}$ as urea and replicated four times. A plot was 2m x 3m with 1m between the plots as shown in Plate 4. Planting method was previously described by Idowu *et al.* (2014). Urea fertilizer was applied at two and six weeks after planting. The vegetable shoot was harvested at six, eight and ten weeks after planting, and the fresh weight was also determined. Soil properties were determined before and after plant harvest. Plant leaf nutrient contents were also determined. Data were subjected to analysis of variance for the treatment effects and when it was significant means were separated using Fisher's Least Significant Difference at 5% level of probability (LSD) (SAS 9.1, 2003).

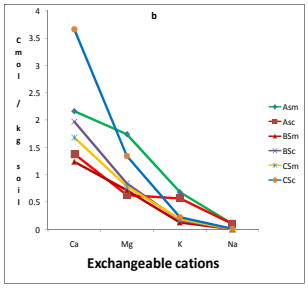
Plate 1: *Solanum macrocarpon* plant

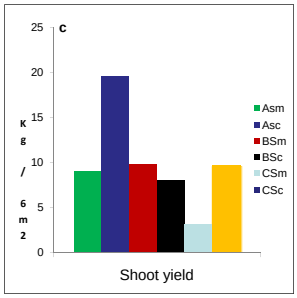
Plate 2: *Solanum scabrum* plant

Plate 3: Map of Nigeria showing the study areas

Plate 4: The vegetables plots' layout







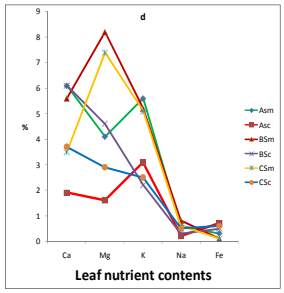


Figure 1:Effects of Nitrogen Fertilizer on overall average of (a) soil total N, pH and Organic matter content, (b) soil exchangeable cations, (c) shoot yield and (d) Leaf nutrient contents. Where : ASm = *S. macrocarpon* in Ile-Ife, ASc= *S. scabrum* in Ile-Ife, BSm = *S. macrocarpon* in Ogbomosho, BSc = *S. scabrum* in Ogbomosho, CSm = *S. macrocarpon* in Iwaro –Oka and CSc = *S. scabrum* in Iwaro-Oka

Lessons Learnt

Soil total N increased consistently and significantly with increasing N application from 40 to 160 kg N ha^{-1}, while soil pH, soil organic matter content and exchangeable cations were not significantly affected in all the locations (Figure 1 a & b). Fresh shoot yield from Ile-Ife, Iwaro-Oka and Ogbomosho were 9.01, 3.21 and 5.87 kg $6m^{-2}$ for *Solanum macrocarpon* and 19.58, 9.83 and 8.06 kg $6m^{-2}$ for *Solanum scabrum,* respectively (Figure 1 c), which increased consistently with increasing rates of N application. *S. macrocarpon* leaf nutrient contents in % range from 3.5 to 10.1 Ca, 4.03 to 9.6 Mg, 4.6 to 5.8 K and 0.5 to 0.9 Na, and 0.3 to 1.4 Fe while 1.9 to 6.1 Ca, 1.6 to 4.6 Mg, 2.2 to 3.1 K and 0.2 to 0.5 Na, and 0.5 to 0.7 Fe were obtained for *S. scabrum*. The vegetables could contribute significantly to food security in the region (Figure 1d).

Conclusion

Application of between 40 and 80 kg N ha^{-1} was sufficient for sustainable soil fertility, optimal yield and good quality *S. macrocarpon and S. scabrum production*. *Solanum macrocarpon* had higher potential for nutrient accumulation. Through greater production and consumption of indigenous vegetables, malnutrition could be reduced significantly and healthy diets promoted in southwest Nigeria and Africa in general.

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