EFFECT OF NITRIFIED URINE CONCENTRATE ON BLACK NIGHTSHADE (*Solanum nigrum*) BIOMASS AND NUTRITIONAL QUALITY

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Summary

Black nightshade (Solanum *nigrum*) is an important nutritious vegetable normally produced by Small holder farmers. A 2 x 3 x3 factorial split-split plot design was carried out in a greenhouse at the University of KwaZulu Natal. Two water level (100 and 50%FC), 3 fertilizer types nitrified urine concentrate (NUC), chicken manure (CM) and urea. Protein content, DPPH% and biomass were determined from harvested edible leaves. There was a significant interaction between water and fertilizer on DPPH% with NUC having the highest (60.2%) at 50%FC. Highest protein content was obtained at 7.8gN per pot using CM (1.93 mg/g). At the highest application rate all plants at both water levels which were treated with NUC died. An inverse relationship between biomass accumulation occurred application rate occurred with the lowest rate yielding better

Introduction

Nitrified urine concentrate (NUC) is a urine based nitrogen (N) fertiliser product processed by nitrification and distillation. NUC could be used as a N-fertiliser source for the production of Black nightshade (*Solanum nigrum*) (an underutilised African leafy vegetable important to smallholder African farmers). These farmers often produce crops under nutrient and water limiting conditions. NUC could provide a potentially new fertilizer source to improve productivity. Previous studies have been carried on Black nightshade using other fertilizer sources such as chicken manure and chemical commercial fertilisers. There are no studies on the use of NUC on Black nightshade. The objective was to investigate the effect of NUC as a nitrogen source on Black nightshade biomass and nutritional quality under limiting water conditions.

Materials and Methods

A pot experiment was carried out in a greenhouse at the University of KwaZulu-Natal. The experiment was laid out as a 2 x 3 x 4 factorial experiment using a split-split plot design replicated 4 times to give a total 72 experimental units (pots). Two separate controls were set at 50% and 100% FC. The main plot was water - 2 levels, (100% field capacity (FC) and 50% FC)), the sub-plot, nitrogen source- 3 levels (NUC, CM and Urea), sub-plot, application rate - 4 levels (2.6 g/pot, 5.2 g/pot and 7.8 g/pot. Data on dry mass, proteins (Bradford assay) and antioxidant capacity using *2, 2*-diphenyl-*1*-picrylhydrazyl (DPPH) radical scavenging ability on edible leaves. GenStat 18th edition statistical software package was used to analyse data. Treatment means were compared at the 5% level of significance.

Results and Discussion

DPPH%

The interaction between fertilizer and water was highly significant (p<0.01) (Fig 1). The level of DPPH increased in both NUC and Urea treatments (60.2%) at 50% due to possibly salts in NUC. Urea also had high DPPH of 47.9% due to burning of leaves after fertilizer application. Under stressful conditions, plants respond by producing reactive oxygen species thus increasing DPPH %. All other treatments did not differ significantly at both water levels.

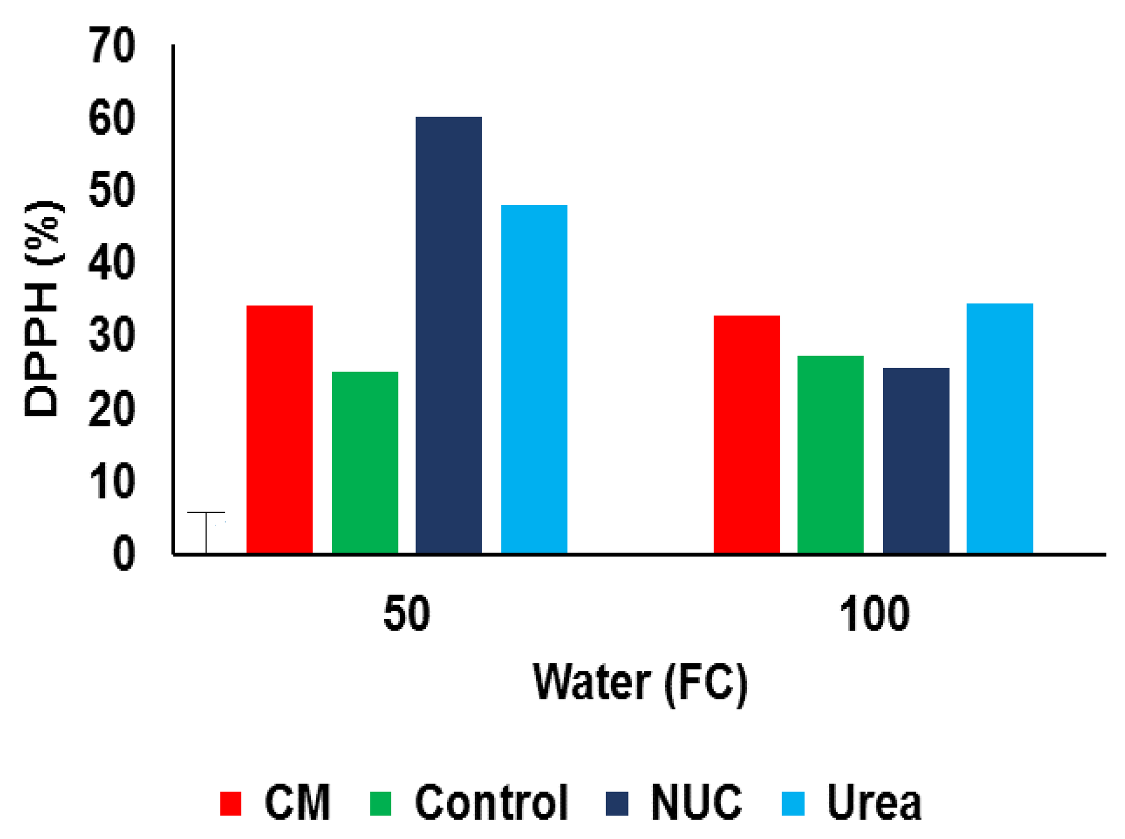

Fig 1: DPPH% Response of black nightshade to different water levels at different application rates

Protein content

Chicken manure had significantly higher protein content (1.93 mg/g) at the highest application rate compared to all the other treatments (p<0.01). At high CM concentration mineralization allowed uptake of N and its conversion into proteins. Once off application of NUC and Urea could have caused shock in the plants restricting N uptake hence low protein synthesis.

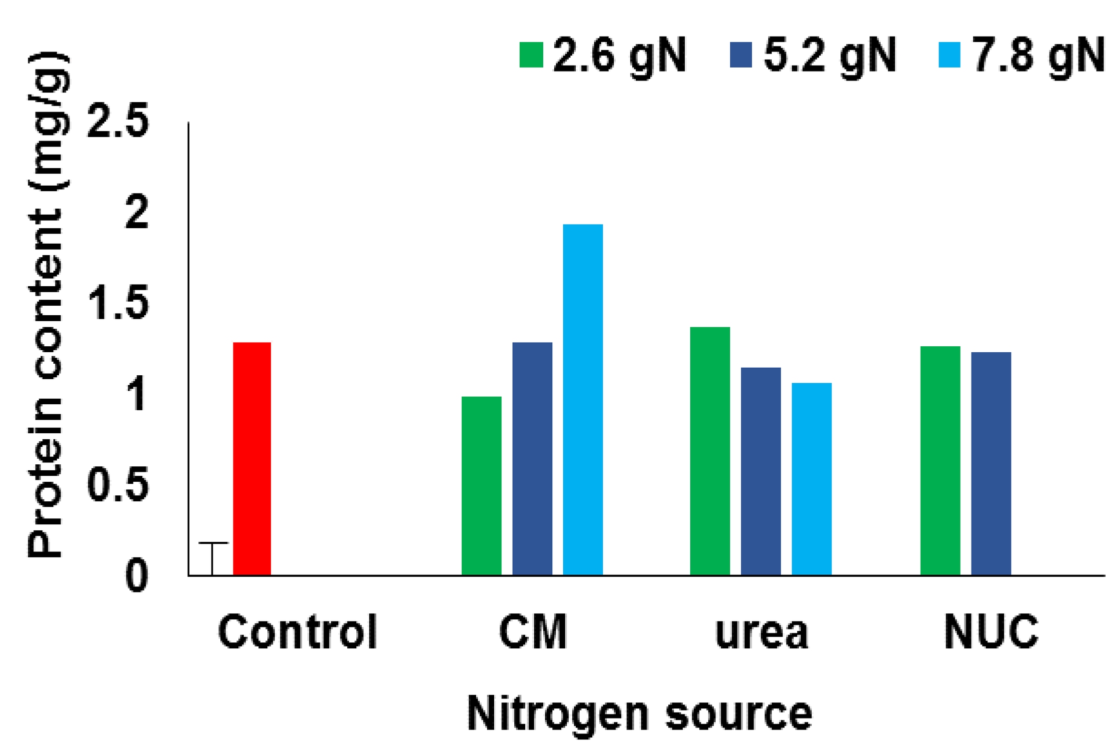

Fig 2: Protein response of Black nightshade to fertilizer type and fertilizer application rate.

Biomass

There was a significant decrease (<0.01) (Fig 3 top) on the interaction between water, rate and fertilizer. At the highest application rate, all plants treated with NUC at both water levels died. Salt in NUC could have caused death of plants through root damage. The remaining plants treated with NUC had the least biomass. No significant differences were observed in biomass at both water levels at all application rates indicating that black nightshade can be grown under lower water conditions. The highest biomass was attained using CM and control at 100 FC (19.2 and 19.4 respectively (Fig 3).

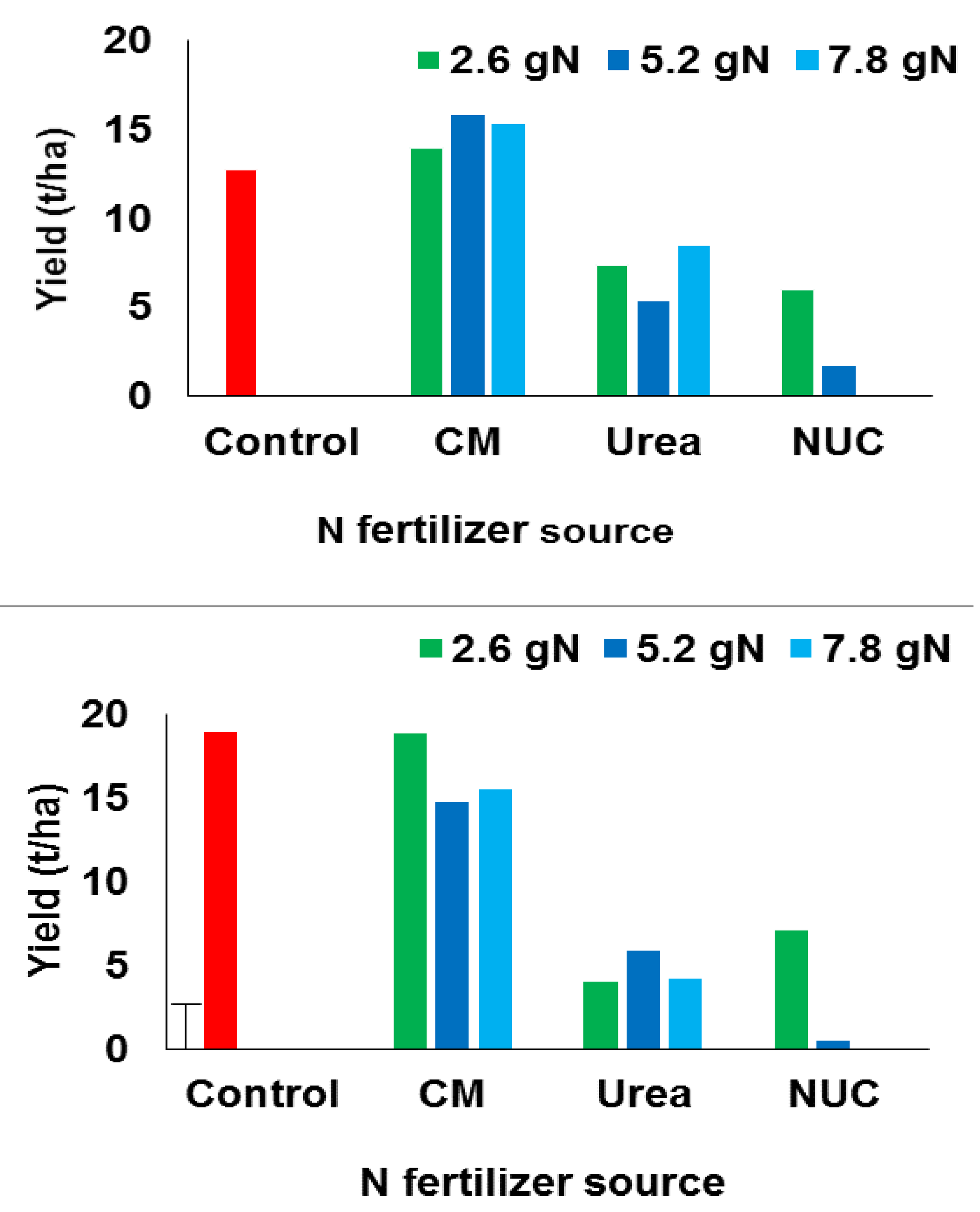

Fig 3: Yield of black nightshade at 100%FC at increasing application rates.

Fig 4: Response of black nightshade to different fertilizers (left to right), control, CM, NUC and urea

Conclusions

Death of plants at the highest application rate using NUC requires further investigation for the presence of salts.

Reference

Edmonds, J. M., and James A. Chweya. J. A. 1997. Black nightshades: *Solanum nigrum* L. and related species. Biodiversity International 15, 17-27.