GROWTH, PHYTOCHEMICAL CONSTITUENTS AND ANTIOXIDANT ACTIVITIES OF AMARANTHUS VIRIDIS AND CORCHORUS OLITORIUS WATERED WITH DETERGENT SOLUTION

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The effect of detergent solution on the growth, phytochemical constituents and antioxidant activity of two vegetable plants, *Amaranthus viridis* and *Corchorus olitorius* were studied. Results revealed that the detergent solution did not significantly affect the growth of either *A. viridis* or *C. olitorius* plants in terms of plant height, fresh weight, dry weight and leaf area. However, *A. viridis* or *C. olitorius* leaves of about the same size and age watered with detergent solution had higher tannin, phenol while those watered with tap water had higher flavonoid. On the other hand, *C. olitorius* plants watered with detergent solution had the highest flavonoid, while those watered with tap water had the highest tannin and phenol. Detergent solution can be used for irrigation of *A. viridis* and *C. olitorius* plants as it did not affect their growth and productivity.

Key words: *Amaranthus viridis*, antioxidant, *Corchorus olitorius*, detergent solution, growth

Detergents contain substances such as chlorine and sodium which may have negative effects on plant growth. However, other constituents of detergent such as phosphates and ammonia may boost plant growth. Detergents also contain a chemical known as surfactant, which is a substance that reduces the surface tension of a liquid that it is dissolved in (Turkovskaya et al. 1997). The more detergent in the soil, the less water will reach the plants roots, and the quicker the plants will show signs of dehydration (Wiel-Shafran et al. 2006).

*Amaranthus viridis* and *Corchorus olitorius* are widely grown in home gardens in West Africa as stable source of leafy vegetables in household diet. Phytochemical analysis of *A. viridis* and *C. olitorius* revealed the amount of flavonoids, phenols and tannins, these phytochemicals have very high antioxidant properties (Kumar et al. 2010), tannins (Awoyinka et al. 1995, Obi et al. 2006). Both plants have antidiabetic, antihyperlipidemic and antioxidant properties (Kumar et al. 2012). However, due to scarcity of water in some areas and lack of adequate information on the part of the occupants of that area, the plants are sometimes watered using detergent solution from laundry, kitchen and other household uses.

This is a report of an investigation on the effect of irrigating common garden plants such as *A. viridis* and *C. olitorius* with detergent solution, with focus on the growth, phytochemical constituents and antioxidant activities.

Seeds of *Amaranthus viridis* and *Corchorus olitorius* cultivar Angbaju were obtained from National...
Horticultural Institute (NIHOT), Ibadan. The experiment was carried out at the Botanical garden, University of Lagos. A branded detergent was bought from a departmental store. The detergent contained linear alkyl benzene sulfonate, sodium tripolyphosphate, sodium carbonate and sodium sulphate.

Two–weeks old seedlings were transplanted into two sets of one hundred and thirty five (135) black polythene bags filled with loamy soil (two seedlings per bag), a set was watered with detergent solution (6 g/litre) while the second set was watered with tap water from two weeks after transplanting. Plants were cultivated throughout in a glass house.

Plant height, fresh weight, dry weight and total leaf area were measured according to the method of Ade-Ademilua and Adesanya (2009).

Leaf samples collected from each set after six weeks of treatment were cleaned and air dried for 5 days in the laboratory. Thereafter, the samples were powdered using an electric blender. Each powdered sample was extracted with methanol in the ratio of 1 to 10. The mixture was soaked for 2 days at room temperature. The extract was filtered through a Whatmann filter paper to obtain a clean extract. The total phenolics, total flavonoid, total tannin, total antioxidant capacity and 1, 1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity assay were determined according to methods described by Grubesic et al. (2005). All statistical analysis was done on three replicates from each set. A single factor Analysis of Variance (ANOVA) was calculated to determine the significant differences between observations from the two sets of each plant species at p=0.05.

*A. viridis* plants watered with detergent solution had significantly (p=0.05) higher plant height, fresh weight and dry weight than those watered with tap water while the result was the reverse for *C. olitorius* plants during most of the period of analysis (Fig. 1). The differences between the growths of plants of same species from the two treatments appear to be consistent from onset of treatment with no indication of the treatments having any effect. This shows that detergent solution did not have any effect on growth of either *A. viridis* or *C. olitorius*. The results shows that detergent solution which is laundry grey water does not affect the growth of *A. viridis* or *C. olitorius* contradicting Travis et al. (2010) assumption that raw grey water affect plant growth. Grey water (include all domestic wastewater except toilet) have been shown to affect the soil properties negatively (Faisal Anwar 2011) and

Fig. 1. Growth parameters of experimental plants watered with detergent solution and tap water. Asterisked means on the same horizontal point are not significantly different at p=0.05. Mean heights of *Amaranthus viridis* (A) and *Corchorus olitorious* (B) plants, mean fresh weights of *A. viridis* (C) and *C. olitorious* (D) plants, mean dry weights of *A. viridis* (E) and *C. olitorious* (F) plants, mean leaf area of *A. viridis* (G) and *C. olitorious* (H) plants, with the LSD values above the graph lines.
laundry grey water itself have been shown to penetrate the soil to a noticeably lesser extent than clean water (Wiel-Shafran et al. 2006). However, plants irrigated with tap water did not do better than those irrigated with detergent solution in this study even in terms of fresh weight that is affected by water availability. In this study, clean water in the detergent solution was able to penetrate the soil as much as tap water.

Results of phytochemical analyses are depicted on Table 1. Leaves of *A. viridis* plants watered with detergent solution had significantly higher total tannin and phenolics but lower flavonoid than plants watered with tap water. Similar results were observed in leaves of *C. olitorius* except that total phenolics were reduced under detergent treatment. Total tannins and flavonoid in leaves appear to be affected by detergent solution irrespective of the species, while the effect of detergent solution on total phenolics in leaves appear to be species specific. Leaves of *A. viridis* watered with tap water showed a significantly higher total antioxidant capability (0.17 μg/ml) and stronger radical scavenging activity (47 μg/ml) than those of plants watered with detergent solution (0.04 μg/ml and 75 μg/ml, respectively). On the other hand, leaves of *C. olitorius* watered with detergent solution showed a significantly higher total antioxidant capability (1.44 μg/ml) and stronger radical scavenging activity (38 μg/ml) than those of plants watered with tap water (0.31 μg/ml and 44 μg/ml, respectively). Leaves of plants from all treatment sets were of same age and significantly indifferent sizes at the time of phytochemical analyses, therefore the difference in results can be related to real treatment. However, the effects of detergent solution on antioxidant capabilities of plants appear to be species specific.

Finley (2008) has reported that domestic grey water did not affect the growth and productivity of lettuce, carrots and peppers. This study also shows that waste detergent solution (at least up to the concentration used in this study) does not affect the growth and productivity of vegetables like *A. viridis* and *C. olitorius* and therefore can be used to irrigate the plants.

**REFERENCES**


