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Keywords

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Plate 5: Lettuce at 21 days.

Plate 6: Lettuce at 42 days.

accumulated value of 253.570 mg/kg and stem with accumulated value of 175.686 mg/kg. In treatment two, the same trend happened with roots accumulated highest value of 315.001 mg/kg, followed by leaves with accumulated value of 270.392 mg/kg and stem with least accumulated value of 195.932 mg/kg. In treatment three, the leaves accumulated the highest value of 434.412 mg/kg, followed by roots with accumulated value of 275.540 mg/kg and stem with least accumulated value of 225.098 mg/kg. In treatment four, leaves accumulated highest value of 275.540 mg/kg, followed by roots with accumulated value of 245.344 mg/kg and stem with least accumulated value of 224.754 mg/kg.

Di erent accumulations were recorded in all the treatments as shown in Figure 1b above. In treatment one, the roots accumulated highest iron of 480.830 mg/kg, followed by the leaves with 448.624 mg/kg and the stem recorded least accumulated value of 264.848 mg/kg. is can be demonstrated as roots>leaves>stem. In treatment two, the same trend of highest root accumulation followed by leaf and stem occurred as it happened in treatment one but in treatment three and four, di erent accumulations were recorded. In treatment two, roots accumulated 574.668 mg/kg of iron, followed by leaves with accumulated value of 418.624 mg/kg and stem with least accumulated iron of 248.446 mg/kg. In treatment three, leaves accumulated more irons, followed by the roots and the stem with the same accumulations recorded in treatment four. Accumulated values in treatment three were as follows; leaves (640.470 mg/kg), roots (510.266 mg/kg) and stem (448.342). Accumulated values in treatment four were follows;

leaves (590.648 mg/kg), roots (435.062 mg/kg) and stem (432.664 mg/kg).

37.139 mg/kg. However, the total level of manganese that was present in both the soil and the polluted water was 39.260 mg/kg which was higher than treatment four accumulation value of 37.188 mg/kg at 21 days a er transplanting. However, treatments one and three accumulated values of 44.091 mg/kg and 47.192 mg/kg were higher than the initial amounts of manganese in both the soil and the unpolluted water. is clearly indicated that it was treatment four that adsorbed level of manganese lower than the initial concentration of manganese in both the soil and the polluted water.

From Figure 2a, manganese generally recorded diverse levels of accumulation at 21 days a er transplanting of the test crop ranging from 31.886 kg/mg to 62.798 mg/kg.

Treatment two with shea nut shells, soil and polluted water, on the average adsorbed high manganese compared to the rest of the treatments ranging from 42.090 mg/kg to 60.396 mg/kg. is demonstrated that, treatment two has strong potential for removal and adsorption of manganese indicating its strong a nity of available surface groups on shea nut shells for manganese.

Leaves of treatment two with shea nut shells, soil and polluted water at 21 days a er transplanting, adsorbed high manganese, followed by the root and the stem. is might occurred because leaves of the test of copper in the test crop on the average were below Anonymous [8], recommended value of 73.30 mg/kg

Conclusion

Results obtained from this study demonstrated that, shea nut shells have adsorption capabilities although the highest adsorption capacity for heavy metals was recorded for manganese with zinc, iron and copper in that order. However, concentrations of manganese, iron, copper and zinc in the unpolluted water were below detection level of 0.001 mg/kg. e adsorption properties of shea nut shells may be used in remediation of contaminated water bodies that contain manganese and zinc to help curb negative health implications that will emanate from these hazards.

Recommendation

Use of shea nut shells in remediation of polluted environments is very economical and environmentally friendly. Shea nut shells are easily accessible because it is agricultural by-product that is prevalent in Northern Ghana. Further research on shea nut shells in phytoremediation should focus on determine the amounts of heavy metals retained in the soil sample a er the experiment and varying the quantities of grounded shea nut shells for this study in di erent levels to help determine the adsorption capabilities of shea nut shells from contaminated water and soils. Also, more research should be conducted to determine the functional groups present on the surface of shea nut shells.

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