

**EFFICACY OF SELECTED PHYTONUTRIENTS ON  
RATS EXPOSED TO CEMENT DUST**

**BY**

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**CERTIFICATION**

*This is to certify that the thesis:*  
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Submitted to the School of Postgraduate Studies

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## DEDICATION

This research project is dedicated to my paternal grandmother, **late Madam Ajibola Bello**. May her gentle soul rest in peace.

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## ABSTRACT

Conventional pollution prevention and control strategies in the cement industry often fail, resulting in exposure of humans to harmful levels of cement dust with attendant health effects. Owing to the renewed interest in plant medicine, there is a need to evaluate the efficacy of some food plants in ameliorating the effects of cement dust exposure. This study analyzed the bioprotective and cell-rebuilding efficacy, as well as effect on overall health, of *Hibiscus sabdariffa* Linn (roselle), *Moringa oleifera* Lam (moringa), *Zingiber officinale* Roscoe (ginger), and *Telfairia occidentalis* Hook-f ('ugwu') in both wild rats (*Rattus rattus* L.) and albino rats (*Rattus norvegicus* W.) that were exposed to cement dust at the cement factory in Shagamu, Nigeria. The wild rats were grouped into seven comprising of 15 rats per group, while the albino rats were grouped into six comprising of 18 rats per group. Group one of both rats (wild and albino) was control 1 while group two of the wild rats was control 2 which were treated with distilled water only. The test groups were treated individually with 400 mg kg<sup>-1</sup> ethanolic extracts of roselle, moringa, ginger, 'ugwu', and a mixture of the plants. Prior to analysis, the weight, gross morphology, elemental analysis of lung tissues, haematological, biochemical, histopathological and DNA analysis were carried out on both groups of rats. After treatment, the weight, birth rate, offspring survival rate, death rate, morphology, and elemental analysis of lung tissues were monitored monthly, while biochemical, histopathological, and DNA analysis were carried out at the end of the exposure.

The test and control rats showed comparable oral bruising and blindness; however, significant differences ( $p < 0.05$ ) were observed between the test and control groups in all other tested parameters. The test rats weighed more than the control rats, and weight differences were

observed among the test rats. The birth, fertility, and offspring survival rates of the test rats were higher than the control rats and the test rats showed a lower death rate when compared with the control rats. The test rats accumulated lower concentrations of calcium, silicon, aluminum, chromium, and lead compared with the control rats. Higher haematological parameters (packed cell volume, haemoglobin, white blood cells, and red blood cells) were noticed in the test rats than in the control rats. The test rats showed moderate to normal biochemical parameters (alanine amino transferase, aspartate amino transferase, alkaline phosphates activity, Serum protein, and reduced glutathione) when compared with the control rats. Severe histological damage was observed in the lung, liver, and kidney tissues of the control rats, while the test rats showed moderate to mild histological conditions. The moderate to normal health status of the test rats may be credited to the antioxidant and cell-rebuilding activities of some nutrients and phytochemicals in the plant extracts.

Overall, the mixture of extracts reduced effects of cement dust exposure more than any individual extract alone. Individually, 'ugwu' performed best, followed by ginger, moringa, and roselle. This study shows that the selected food plants ameliorate the effects of cement dust on exposed rats; that the food plants could be produced in forms to be taken as daily supplements for overall well-being of the exposed rats; and that the inhabitants of affected places should be advised on the possible benefits of including these phytonutrients in their diets.