

Original Research Article

HEAVY METAL PROFILES OF MEDICINAL PLANTS FOUND WITHIN THE VICINITY OF QUARRY SITE IN DEMSA, ADAMAWA STATE, NIGERIA.

ABSTRACT

Heavy metals profile of ethanolic leaves extracts of some medicinal plants was carried out so as to ascertain the levels of Chromium (Cr), Cadmium (Cd), Lead (Pb), Manganese (Mn) and Nickel (Ni) in *Anogeissus leiocarpus*, *Bauhinia reticulata*, *Prosopis oblonga*, *Sterculia tomentosa* and *Tamarindus indica*, because leaves of these plants are used for treatment of some ailments by the people residing in that community where quarry factory was situated. The leaves of the plants were dried, grinded to powder and digested. The digests were analyzed for the trace metals using Atomic Absorption Spectrophotometer (AAS) model 210VGP and the result was interpreted using statistical analysis. The highest value for Manganese (Mn) was obtained from *Anogeissus leiocarpus* sample with 5.31mg/l from the Quarry site, followed by *Sterculia tomentosa* with 1.6mg/l, *Tamarindus indica* with 1.56mg/l, *Prosopis oblonga* with 1.46mg/l and least is *Bauhinia reticulata* with 1.22mg/l. Chromium (Cr) has value of <0.04, Cadmium (Cd) with <0.01 and Nickel (Ni) having <0.05 in all the samples. The samples away from the Quarry site has 0.68mg/l of Mn in *Bauhinia reticulata* while both *Anogeissus leiocarpus* and *Tamarindus indica* has values of 0.03mg/l. Lead (Pb) was detected in only one of the control sample site with value of 0.08mg/l in *Bauhinia reticulata* and in three plant samples from the Quarry site which include *Anogeissus leiocarpus* with 0.06mg/l and 0.07mg/l for *Bauhinia reticulata* and 0.07mg/l for *Prosopis oblonga* respectively. Other trace metals results obtained away from the quarry site include (Cr) with value of <0.04, (Cd) with <0.01 and (Ni) with <0.05 in all the samples. Some plants in the quarry site contain Mn and Pb above their threshold levels, therefore these

26 plants are not recommended for consumption by animals to avoid bioaccumulation which
27 will in further bring about health hazard.

28

29

30 **Keywords:** Heavy metals, *Sterculia tomentosa*, sample, manganese, quarry

31 INTRODUCTION

32 Any toxic metal may be called heavy metal, irrespective of their atomic mass or density [1].

33 Heavy metals are a member of an ill-defined subset of elements that exhibit metallic
34 properties. These include the transition metals, some metalloids, lanthanides, and actinides.

35 One source defines heavy metal as one of the common transition metals, such as copper, lead,
36 and zinc. These metals are a cause of environmental pollution from sources such as leaded
37 petrol, industrial effluents, and leaching of metal ions from the soil into lakes and rivers by
38 acid rain [2].

39 Any metal (or metalloid) species may be considered a “contaminant” if it occurs where it is
40 unwanted, or in a form or concentration that causes a detrimental human or environmental
41 effect. Heavy Metals/metalloids include lead (Pb), cadmium (Cd), mercury (Hg), arsenic
42 (As), chromium (Cr), copper (Cu), selenium (Se), nickel (Ni), silver (Ag), and zinc (Zn).
43 Other less common metallic contaminants include aluminium (Al), cesium (Cs), cobalt (Co),
44 manganese (Mn), molybdenum (Mo), strontium (Sr), and uranium (U) [3].

45 Living organisms require varying amounts of heavy metals. Iron, cobalt, copper, manganese,
46 molybdenum, and zinc are required by humans [4]. All metals are toxic at higher
47 concentrations [5]. Excessive levels can be damaging to the organism. Other heavy metals
48 such as mercury, plutonium, and lead are toxic metals that have no known vital or beneficial
49 effect on living organisms, and their accumulation over time in the bodies of animals can
50 cause serious illness. Certain elements that are normally toxic are for certain organisms or

51 under certain conditions, beneficial. Examples include vanadium, tungsten, and even
52 cadmium [1].

53 Metal concentration in soil typically ranges from less than one to as high as 100,000 mg/kg
54 [6]. Heavy metals are the main group of inorganic contaminants and a considerable large
55 area on land is contaminated with them due to use of sludge or municipal compost, pesticides,
56 fertilizers, and emissions from municipal wastes incinerates, exudates, residues from
57 metalliferous mines and smelting industries. Irrespective of the origin of the metals in the
58 soil, excessive levels of many metals can result in soil quality degradation, crop yield
59 reduction, and poor quality of agricultural products, posing significant hazards to human,
60 animal, and ecosystem health [7].

61 Heavy metal contaminations of land resources continue to be the focus of numerous
62 environmental studies and attract a great deal of attention worldwide. This is attributed to
63 non--biodegradability and persistence of heavy metals in soils. In order to identify spatial
64 relationship of heavy metals in soil-rice system at a regional scale, 96 pairs of rice and soil
65 samples were collected from Wenling in Zhejiang province, China, which is one of the well-
66 known electronic and electric waste recycling centers. The results indicated some studied
67 areas had potential contaminations by heavy metals, especially by Cd. The spatial distribution
68 of Cd, Cu, Pb, and Zn illustrated that the highest concentrations were located in the northwest
69 areas and the accumulation of these metals may be due to the industrialization, agricultural
70 chemicals and other human activities [8].

71 Human health has become threatened due to exposure to hazardous and toxic substances,
72 such as industrial effluents and emissions, sewage sludge, fertilizers and agrochemicals [9].

73 The possibility of their movement along the food chain cannot be over ruled out, Cd, Pb and
74 Hg are major contaminants of food and may be considered an important problem to our

75 environment while others like Fe, Zn and Cu are essential for biochemical reactions in the
76 body [10].

77 Medicinal plants represent a rich source from which powerful drugs are produced [11].

78 Herbal medicine has shown to be effective and about 60percent of the rural population
79 depends on it for their primary health care [12, 13]. The interest in the scientific
80 investigation of medicinal plants from Nigeria is based on the claims of their effective use for
81 the treatment of many diseases, therefore research into the effects of these local medicinal
82 plants is expected to enhance the use of these plants against diseases caused by the test
83 pathogens, however most of these plants used in herbal medicine have not been screened for
84 their toxicity effects. Traditional medical herbs are used for strengthening the body immune
85 system and nutritional elements. According to Sofowora [14], many plants have been
86 documented to have the efficacy to treat many diseases in Nigeria. In order to control and
87 prevent the inevitable progression of the immune system destruction that these stresses
88 causes, therapy must be diverse, involving all levels of health, diet, use of mineral
89 supplements and life style. It has been revealed that, elements in biological sources are more
90 efficient than pure elemental status, because of presence of element as well as presence of
91 vitamins and other physiological active compounds [15]. A research report by Rajurkar and
92 Damame[16] shows correlation between elemental content of medicinal plants and their
93 curative ability, so the quantitative estimation of various micro element concentrations is
94 important for determining the effectiveness of the medicinal plants in treating various
95 disease, as sources of supplement and also to understand their pharmacological action.

96 Moreover macro and micro elemental analysis of medicinal plants can be used to decide the
97 dosage the herbal drugs prepared from these plant materials and also the concentration of
98 toxic element like Pb, Cd and Hg [16]. Studies conducted by [17, 18] have demonstrated that

99 the relative high levels of essential elements such as Fe, Mn, Zn and Ca influence the
100 retention of toxic elements in animals and human beings.

101 Therefore, the main aim of the research is to carry out the heavy metal analysis of some
102 medicinal plants found in the vicinity of quarry site.

103

104

105

106 **MATERIALS AND METHODS**

107 **Study Area**

108 The study area is quarry site situated in Demsa Local Government Area of Adamawa State,
109 Nigeria. Fig 1 shows the map of the study area. Demsa is a Local Government Area of
110 Adamawa State, Nigeria. Demsa lies on the Benue River. Coordinates: 9⁰25'N 12⁰8'E with
111 population of 180,251. The state spans two vegetation zones namely Sudan and Sahel
112 savannah. Effective rains start in late June and end in late October. They dry seasons start in
113 October and end in June. The occupation of the rural community of Demsa LGA has always
114 been agrarian. The local government communities of these areas have been using these
115 medicinal plants under investigation to cure various diseases for a long time.

116

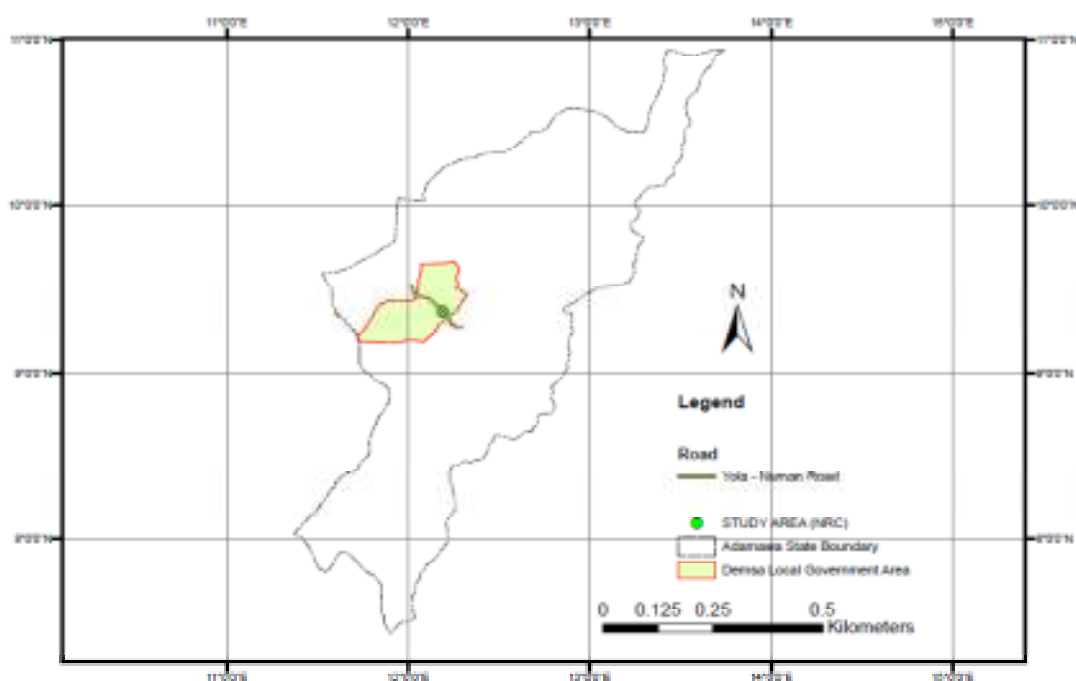


Fig. 1: Map of Adamawa State Showing Demsa LGA and the Study Area

Sample Collection

Leave samples of *Bauhinia reticulata*, *Prosopis oblonga*, *Sterculia tomentosa*, *Tamarindus indica* and *Anogeissus leiocarpus* were collected from the Quarry site (N R C) along Numan road in Demsa L.G.A and transported to Modibbo Adama University of Technology, Yola, where they were identified and authenticated by Dr A. Jauro from forestry department. Voucher specimens of these plants were deposited at the University Herbarium.

Sample Preparation

The plant samples were washed thoroughly with tap water to remove the soil particles from the leaves. The samples were then cut into smaller pieces and air dried for some days. The dried samples were ground into powder and stored in labeled polythene bags. Each powdered sample was digested as reported by Barminas et al. [19]. 2gm of each sample was weighed