COMPARATIVE EFFECT OF RADIOACTIVE RADIATION ON ROOTS IN COASTAL AND HINTERLAND LOCATIONS IN AKWA IBOM STATE, NIGERIA.

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Abstract
The detection of the radiation levels in root crops from Ibomo (an oil producing area) and Uyo, (a non oil producing area) in Akwa Ibom state was carried out. The radioactivity level in Cassava, Potato, Sweet yam, water yam and cocoyam was investigated. Result shows that the radiation level in root samples in Uyo ranges between 8.58 mBq⁻¹ and 1.06 mBq⁻¹ as compared with those from Ibomo, which ranges between 34.7 mBq⁻¹ and 3.7 mBq⁻¹. Yam and cassava samples from Ibomo have the highest radioactive levels of 34.7 mBq⁻¹ while water yam sample in Uyo has the highest radioactive level of radioactive materials in roots than Uyo. This is probably due to the oil producing activities in the area.

Keywords: NORM, radioactivity, ionization, roots.

Introduction
Akwa Ibom state is an oil producing state in Nigeria. As a result of the production of oil and oil spillage, naturally occurring radioactive material (NORM), has been distributed into the Environment.

The nature of the root system of a plant and the depth to which it extend vertically and laterally depend upon factors as the soil moisture, the soil air and temperature and the physical nature of the soil. Roots play several roles in the life of the plant they anchor the plant in the soil, they absorb water and minerals from the soil, they transport these minerals from the region of absorption to the base of the stem and they may serve as food accumulating organs (Wilson et al, 1971).

Three types of radiations have been identified alpha particles, beta particles and gamma rays. In any radioactive disfiguration, the alpha or beta particles will be emitted, it may be accompanied by a gamma ray.

The rate at which radioactive materials disintegrate or decay is almost independent of all physical and chemical conditions. The activity of a radioactive sample can be expressed in terms of its rate of decay, that is the number of disintegration per second in the sample (Holwill and silvester, 1976).

There are a number of devices that can be used to detect the particle and photons emitted when a radioactive nucleus decays. Such devices detect the ionization that these particles and photon cause as they pass through matter (Cuttell and Johnson, 1998). In traving techniques, with the presence of a radioactive substance is easily detected with a Geiger Muller counter, based on the ionization produced by the radioactive emanations, (Eno, 1998). A Geiger Muller tube is widely used for detecting ionizing particles or radiation (Nelkon and Parker, 1977).

Material and Methods
Cassava, potato, sweet yam, water yam and cocoyam roots were obtained each from two locations in Akwa Ibom State, that is, Ibomo and Uyo. The roots gotten from Ibomo were from Mkpanek and Upenka in Ibomo Local Government Area. The ones gotten from Uyo were from Udooette Street in Uyo Local Government Area.

Geiger-Muller counter was used for this experiment to detect the radiation emitted by these roots. Each root sample was merged before taking readings.

Geiger-Muller tube was used for this experiment with a dekatron counter. The tube was calibrated as expected to obtain its characterization curve. Each sample was washed thoroughly with deionized water and then cut into piece the peel, bottom, middle and head close to the stock.
particular piece was weighed and marshed one after another and poured into a 30ml breaker to obtain its counting rate. Thus four values of counting rate were obtained for each root sample. After every measurement the beaker was washed and ringed again.

The average of the four values is used for required analysis. Thus the value of each root sample given in the tables is actually the average of four values taken with four pieces cut out of the sample.

**Result and discussion**

The result for the radiation levels in each of the root samples for the two locations are presented in Tables 1 and 2. Table 1 which is the experimental results for Ibemo roots shows that yam and cassava have the highest radiation count of 34.7 mBq.g⁻¹ and water yam the least of 3.48 mBq.g⁻¹. Table 2 for Uyo roots shows that water yam has the highest radiation count of 8.55 mBq.g⁻¹ and sweet yam the least of 1.06 mBq.g⁻¹.

A histogram Fig. 1 gives us the comparative analysis display for the two locations showing yam and cassava with the highest radioactive levels whereas water yam appear to have highest in Uyo. We can deduce that the source of radioactivity is mainly due to the environment and not just the root. Generally figure 1 shows that roots in Ibemo have a higher radioactive level as compared to roots from Uyo, a non oil producing area many (oil) drilling sites and production facilities have radioactive materials associated with them. Some of these radioactive materials, primarily tracers of logging tools are deliberately brought to the site for use while other materials are naturally occurring and are called naturally occurring radioactive materials (NORM). During drilling water based drilling muds and cuttings are discharged overboard (FAQ). Drilling fluids used for onshore wells are primarily disposed of in reserves pit. While in many areas drilling fluids from offshore

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**Table 1: Experimental result obtained from Ibemo**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Average background count for 30 minutes</th>
<th>Average mass of sample in gramme (g)</th>
<th>Average background sample count for 30 minutes</th>
<th>Average sample count per second per gramme (Bq⁻¹)</th>
<th>Average sample count mBq⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava</td>
<td>324.0</td>
<td>4.462</td>
<td>603.0</td>
<td>279.0</td>
<td>0.0034</td>
</tr>
<tr>
<td>Potato</td>
<td>406.0</td>
<td>4.141</td>
<td>551.5</td>
<td>27.5</td>
<td>0.0047</td>
</tr>
<tr>
<td>Sweet yam</td>
<td>330.0</td>
<td>2.768</td>
<td>390.0</td>
<td>60.0</td>
<td>0.0019</td>
</tr>
<tr>
<td>Yam</td>
<td>351.5</td>
<td>4.828</td>
<td>651.0</td>
<td>801.5</td>
<td>0.0037</td>
</tr>
<tr>
<td>Water yam</td>
<td>290.3</td>
<td>6.646</td>
<td>302.0</td>
<td>41.7</td>
<td>0.0034</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>277.5</td>
<td>7.998</td>
<td>376.5</td>
<td>99.0</td>
<td>0.0060</td>
</tr>
</tbody>
</table>

**Table 2: Experimental result obtained from Uyo**

<table>
<thead>
<tr>
<th>Sample</th>
<th>background count for 30 minutes</th>
<th>mass of sample used (g)</th>
<th>background = sample count for 30 minutes</th>
<th>sample count per second per gramme</th>
<th>sample count mBq⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava</td>
<td>354.0</td>
<td>4.6235</td>
<td>521.5</td>
<td>0.0811</td>
<td>8.11</td>
</tr>
<tr>
<td>Potato</td>
<td>332.5</td>
<td>6.8413</td>
<td>251.0</td>
<td>0.0217</td>
<td>2.17</td>
</tr>
<tr>
<td>Sweet yam</td>
<td>301.5</td>
<td>5.2183</td>
<td>111.5</td>
<td>0.0460</td>
<td>4.6</td>
</tr>
<tr>
<td>Yam</td>
<td>358.5</td>
<td>4.3928</td>
<td>499.0</td>
<td>0.0513</td>
<td>5.1</td>
</tr>
<tr>
<td>Water yam</td>
<td>305.75</td>
<td>5.7483</td>
<td>394.5</td>
<td>0.0038</td>
<td>3.88</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>343.5</td>
<td>5.5755</td>
<td>355.5</td>
<td>0.00418</td>
<td>4.18</td>
</tr>
</tbody>
</table>
Platforms have been dumped overboard. (Reis, 1996). When oil is species on water, it spreads out over the water surface and moves with the wind and water currents (Reis, 1996). This water gets into the swamps and has effect on the crops planted in these areas. This should be the case with Ibeno. Since the level of permissible radioactivity level is 360 mBq·g⁻¹, these levels of radioactive material in roots are not harmful.

Fig. 1: A histogram for the comparison of the radiation levels in roots from two locations in Akwa Ibom State; viz Ibeno (an oil producing area) ands Uyo (an non-oil producing area).

Generally, Fig. 1 shows that roots in Ibeno have a higher radioactive level as compared to roots from Uyo, a non oil producing area many (oil) drilling sites and production facilities have radioactive materials associated with them. Some of these radioactive materials, primarily tracers of logging tools are deliberately brought to the site for use while other materials are naturally occurring and are called naturally occurring radioactive materials (NORM). During drilling water based drilling muds and cuttings are discharged overboard (FAQ), drilling fluids used for onshore wells are primarily disposed of in reserves pit. While in many areas drilling fluids from offshore platforms have been dumped overboard. (Reis, 1996). When oil is species on water, it spreads out over the water surface and moves with the wind and water currents (Reis, 1996). This water gets into the swamps and has effect on the crops planted in these areas. This should be the case with Ibeno. Since the level of permissible radioactivity level is 360 mBq·g⁻¹, these levels of radioactive material in roots are not harmful to human health. Even though the current level is not harmful today, continuous accumulation may make it significant and harmful tomorrow.

Conclusion
The result of the study shows that Ibeno has a higher level of radioactive materials in roots than in Uyo. This is probably due to the oil activities in the area.

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References


