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Biometric Indices of *Arachis hypogaea* Plant Grown in Kutchalli Waste Pit Materials (Soils) in Borno State, Nigeria

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Abstract

Kutchalli drilling waste pit materials (WPM) in the Nigerian National Petroleum Corporation, NNPC, exploration site in Borno State of Nigeria was evaluated for systemic toxicity to inhabitants (man, animal and plants) via the food chain. In this experiment, biometric indices were analysed using standard methods. Results obtained showed that the control soil (group 1) had plant height of 27cm ±0.2, leaf length 2.8cm ±0.3, while those of the wpm soils of group 5 had plant height of 25cm ±0.2, leaf length 2.3cm ±0.1 and group 7 plant height of 19cm ±0.3 and 1.6cm ±0.2 with a significant difference at $p<0.5$. Currently, WPM generated from crude oil drilling activities are not properly disposed off, therefore usually get washed away into various water bodies and arable farm lands through leaching. In view of these, fears have been expressed in connection with the utilization of these food products for consumption, which are believed to be of serious health risks to both plants and animals (man). *Arachis hypogaea* was used as a test plant to ascertain these fears.

Keywords: Kutchalli, WPM, Biometric, ground nut, Borno State, Nigeria

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INTRODUCTION

Nigeria has enjoyed economic and industrial growth over the years due to the production of petroleum products. This growth is not without environmental cost. A realization that chemical contamination of the environment is extensive and significant has emerged, largely as a result of increased awareness and improved methods of evaluation[1]. Accidental spillage of drilling oil can also occur due to overflow from waste pits into the surrounding farm land and adjacent water bodies[2].

The pollutants generated from these explorative procedures have been implicated in the cause of many biochemical and toxicological effects on plants, aquatic and terrestrial animals[3].

Although various research works have been done on crude oil contamination, very little or no work has actually been carried out on the impact waste pit materials emanating from crude oil exploration on plants and animals lives. This is of imperative medical, toxicological and economical importance because inadequate waste disposal mechanism has not been imbibed in Nigeria. It is on this premise that this research intends to look at the biometric indices of ground nut (*Arachis hypogaea*) plant grown in kutchalli waste pit materials generated in NNPC exploration sites, Borno State, Nigeria. Some waste pits in Nigeria especially that of Kutchalli can produce all the problems associated with all such drilling activities.

MATERIALS AND METHODS

The study area

Soil samples used for this study were obtained from different sites within Borno Stat, Nigeria (Long. 13.5˚N, lat. 13.6˚E (Fig1). Kutchalli soil was collected some 25 metres South East of the petroleum prospective drilling rig in Kutchalli village. The soil (waste pit) was obtained as (test) pooled soil samples obtained from different points within 25 metres radius.

The second set of soil was obtained from Monguno. The collection site was an abandoned fallow land at Monguno town which is about 100km south of kutchalli. This soil sample served as control for this experiment.

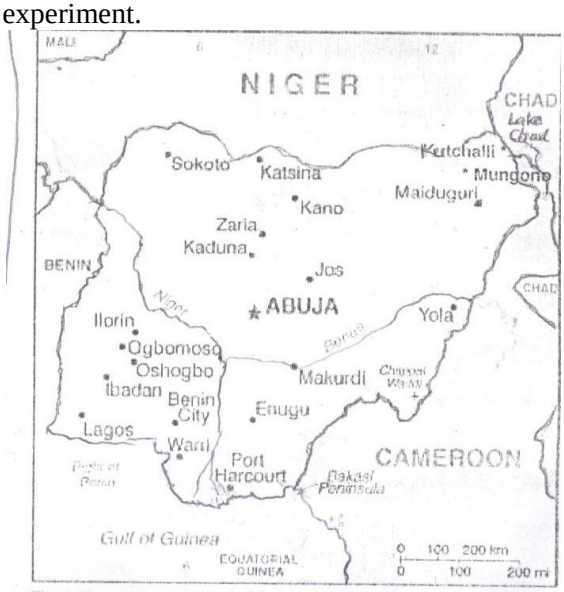

Fig. 1: Map of Nigeria indicating the location of Kutchalli between Maiduguri and Lake Chad. Source: Modified from http://www.cia.gov/cia/publications/factbook/geos/ni.html, date 29 June 2005

The test soil (waste pit) was usually emptied into a waste pit forming a huge deposit near the Nigerian end of Lake Chad (Fig 1). Different waste pit soils were collected from locations and mixed control soils as shown in Table 1 to form the different test soils.

S/N	SOIL TYPES	GROUPS
1.	Control Soil (Monguno)	Group 1
2.	Waste Pit Materials I	Group 2
3.	Waste Pit Materials II	Group 3
4.	Waste Pit Materials III	Group 4
5.	50% $^{w}/_{w}$ Group 1 + Group 2	Group 5
6.	50% $^{w}/_{w}$ Group 1 + Group 3	Group 6
7.	50% $^{w}/_{w}$ Group 1 + Group 4	Group 7

Groups 2, 3 and 4 were different waste-pit materials obtained during petroleum drilling operations in the locations purported to have oil deposits in Kutchalli areas of Borno state. Drilling mud and fluids were employed as lubricants for the drilling rigs

Plants materials

The groundnut seeds (*Arachis hypogaea*) used were confirmed by Kutchalli villagers as those grown within the village and its environs. The seeds were purchased at Kangarowa, being the only market near Kutchalli village at the time of this research. Seeds were tested for viability by simple flotation technique[4] before being put to use. Planting was done in triplicates and monitored through germination to harvest.

Biometric Analysis

Length of plant leaves were measured by use of a calibrated ruler, while the thickness

(width) was measured by use of a veneer caliper. The plant height was determined by use of a calibrated measured tape by the method of Oyenuga (1982)[5].

Statistical Analysis

The conduct of this research was based on randomized block design with seven (7) different soil groups and they were in three (3) replications. Data generated were analysed using the one way analysis of variance[6] to determine the effects of the waste pit materials combination on the growth of test points, where significant F values were obtained and differences between individual mean were tested using the Ducan Multiple Range (DMR) test at 95% confidence limits.

RESULTS AND DISCUSSION

The various soil types of groups 2, 3, 4, and 6 did not favour plant growth. Only the control soil group 1 and groups 5 and 7 respectively favoured plant germination and till the time of harvest[7,8]. Table 2 shows variations in vine length, width, moisture content, colour, dry matter yield and plant height of *Arachis hypogaea* in the various waste pit materials (groups 5 and 7) and that of the control soil (group 1). There was no significant difference between them in terms of vine length and width of leaves ($p>0.05$) throughout the duration of the plant growth. However, there was slight difference in plant height when the control plants were compared with the WMP grown plants ($P<0.05$) throughout the duration till harvest. The plants of groups 5 and 7 exhibited yellow coloration of leaves from week four and above and this probably affected the percentage dry matter accumulate in groups 5 and 7 from week eight which was significant when compared with that of the control soil, group 1 ($p<0.05$). The waste pit materials (soils) seemed to have inhibited seed germination in the tested plant. Lack of germination in polluted soil has been associated with loss of seed viability or unfavourable soil conditions[9]. Plant heights recorded in this experiment as shown in Table 2 revealed that those plants grown in the WPM are significantly lower than those of the control soil (group 1). It is possible that the difference observed could be due to the toxic effects of waste pit materials soils[10].

The plant heights of group 7 were significantly lowered from week 4 and beyond. Schwendinger (1968)[10] reported that there are widely different responses to pollution by plants. It has been shown that plant height is controlled by the genotype of the plant and environmental interactions[11]. In 1995, Weiss *et al*[12] reported that, of the factors affecting plant height that of the environments is the most prominent.

However, the plant leaf vine length and width were significantly lower when compared with the control from week 4 in groups 5 and 7 ($p<0.05$). The moisture content of the plant in groups 5 and 7 were lower than that of control, but this was not however significant. The dry matter accumulate were higher in the WMP grown plants of groups 5 and 7

Table 2: Biometric Indices of Ground Nut Plant (*Arachis hypogea*) Grown in Control Soil Waste Pit Material Soils

Soil types	Leaf Vine Length cm	Leaf Width cm	Moisture content %	Leaf Colour	Dry matter Accumulate %	Plant Height cm	Duration
Group 1	1.8±0.3	1.5±0.3	NA	Green	NA	11.4±0.2	
Group 5	1.8±0.2	1.5±0.1	NA	Green	NA	11.2±0.2	WK 1
Group 7	1.8±0.2	1.5±0.3	NA	Green	NA	9.2±0. 1	
Group 1	2.8±0.5	2.0±0.3	93	Green	6.6	27±0.3	
Group 5	2.3±0.3	1.7±0.2	92	Slightly Yellow	8.3	25±0.3	WK 4
Group 7	2.0±0.2	1.5±0.2	92	Slightly Yellow	8.4	18±0.3	
Group 1	2.8±0.3	2.0±0.2	88	Green	8.7	27±0.2	
Group 5	2.3±0.1	1.7±0.2	86	Slightly Yellow	11.5	25±0.2	WK 8
Group 7	2.6±0.2	1.3±0.2	85	Slightly Yellow	13.6	19±0.2	

This study has examined the effects of waste materials and control soil on the biometric properties of a common leguminous proteinous food widely consumed by Nigerians.

In the course of the research work, out of the six purported toxic waste pits soils, four did not favour plant germination and growth at all. Only two of the soils favoured growth, group 5 and 7 respectively, when compared with the normal control soil (group 1). Plant growth and development in the control soil was superior to those of Kutchalli waste pit soils (group 5 and 7).

The lack of germination of plants in groups 2, 3, 4 and 6 and poor growth of plant in group 5 and 7 when compared with the control plant (group 1), was due to poor soil conditions. As already shown, this diminished growth could be due to the toxic nature of the waste-pit materials of Kutchalli exploration sites. This toxicity may also, by inference be applicable to other living organisms in the environment as well, especially man that feeds on crops grown in these polluted vegetation by waste pit materials not properly disposed or bioremediated. We recommend the prevention of waste drilling materials from getting into the surrounding environment such as subsoil, arable farmland and fresh water bodies.

REFERENCES

1. **Anoliefo, O. G, Omoanghe, S. I. and Elijah, I. O. (2006)** Sensitivity Studies of the common Bean (*V. unguiculata*) and Maize (*Z. mays*) to different Soil Types from the Crude Oil Drilling at Kutchalli; Nigeria. *Journal of Soils and Sediments* **6**: 30-36.
2. **Ekundayo, J. A. and Benka-Coker, M. O. O. (1994)** Effects of Exposure of Aquatic Snails to Sublethal Concentration of Waste Drilling Fluid. *Environmental Monitoring and Assessment* **30**:291-297
3. **Ovuru, S. S., Berepubo, N. A. and Nodu, M. B. (2004)** Biochemical Blood Parameters in Semi-adult Rabbits Experimentally Fed Crude Oil Contaminated Diets. *Afr.J. Biotechnol* **3**:343-345
4. **Anoliefo, O. G. and Vwioko, D. E. (1995)** Spent Lubricating Oil Effect on The Growth of *C. Annum* L, and L. *Esculentum* Mill. *Environmental Pollution 88*: 361-364.
5. **Oyenuga, V. A. (1982)** Nigeria's Food and Feeding Stuffs. Ibadan Press, 87-89.
6. **Sokal, R. R. and Rohlf, F. J. (1976)** The Principles and Practice of Statistics in Biological Research. Freeman and Company, San Francisco, 469-484.
7. **Amadi, A., Abbey, S. D. and Nma, A. (1996)** Chronic Effects of Oil Spill on Soil Properties and Microflora of a Rainforest Ecosystem in Nigeria. *Water, Air and Soil Pollution* **86**: 1-11
8. **Rowell, M. I. (1977)** The Effects of Crude Oil Spill on Soil; A Review of Literature, In: Toogooo, J.A. (ed), *The Reclamation of Agricultural Soils After Oil Spills*. Department of Soil Science, University of Alberta, Edmonton. 1-33
9. **Udo, E. J. and Fayemi, A. A. A. (1975)** The Effects of oil Pollution of Soil on Germination, Growth and Nutrient Uptake of Corn. *Journal of Environmental Quality* **4**: 537-540.
10. **Schwendinger, R. B. (1968)** Reclamation of Soil Contaminated with Oil. *Journal of Institute of Petroleum* **54**:145-151
11. **Budak, N., Baenziger, P. S., Eskridge, K. M. Baltensperger, D. D. and Morenno-Sevilla. B. (1995)** Plant Height Response of Semi-dwarf and non Semi-dwarf Wheat to the environment. *Crop Science* **35**: 447-451.
12. **Weiss, A., Budak, N. and Baenziger, P. S. (1995)** Using Transportation to characterize Plant Height in Winter Wheat in Different Environments: A Simulation Study. *Canadian Journal of Plant Science* **75**: 538-587.