EFFECT OF USED ENGINE OIL POLLUTION ON EARLY SEEDLING GROWTH OF *TELFAIRIA OCCIDENTALS* AND *ZEA MAYS*

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Abstract

The ability of *Telfairia occidentalis* (fluted pumpkin) and *Zea mays* (maize) to thrive in soil supplemented with varying concentration of used engine oil ranging from 150 – 250 ml. in a green house as well as extracts derived from these soils in petri-dishes in the laboratory was investigated. The parameters considered in the green house were heights and number of leaves while those of the laboratory were radicle and plumule lengths. In both species, early growth was better in control than those in the treatments, the growth inhibition in the seedlings increased with the increase in concentration of the used oil pollutants. There were gross reductions in the number of leaves obtained in the early growth of both species from the treatments. Treatments with extracts derived from used engine oil polluted soils resulted in the inhibition of the radicles and plumule growth in both species at all the extract concentrations. It could be inferred from the results that used engine oils have inhibitory effects on the early seedling growth of *Telfairia occidentalis* and *Zea mays.*

Introduction

Crude oil pollution had been previously identified to cause unsatisfactory growth in plants (Dejong 1980). Previous studies had revealed also, that the crude oil pollutants resulted to insufficient aeration of the soil due to displacement of air spaces between soil particles, retard growth of plants, result in chlorosis of leaves and dehydration of plants (Rowell 1977).

However, farmers at ONELGA cultivate *Telfairia occidentalis* and *Zea mays* annually. This study was taken to investigate the effects of used engine oil pollution on the early seedling growth of *Telfairia occidentalis* and *Zea mays* because motor – cycle mechanics at Obo – Road – side junction in Omoku urban spread engine oil indiscriminately within the premises of their workshop.

Method and Materials

The materials used were:

i. *Telfairia occidentalis* (viable seeds)
ii. Zea Mays (seeds) both were procured at Omoku market.
iii. Pots and Petri – dishes.
iv. Used engine – oil (150 – 250ml/conc.)
v. Distilled water.

Site

Federal College of Education (Technical) Omoku School of Science Education site. Omoku is Located at latitude 7^0 N and Longitude 23^0E of Port Harcourt Rivers State, Nigeria.

The experiments were carried out in two areas of the school premises.

a. Green house
b. Biology Laboratory

a. **Green House Experiment:** The soil samples were collected at the back of the green house, school of science Education. Twenty – four (24) planting pots were grouped "A" and "B" at twelve (12) each "A" was used for the experiment on *Telfairial occidentalis* while "B" was for Zea Mays. Each group was sub-grouped into A1, A2, A3, A4 and B1, B2, B3, B4. and each sub-group has three (3) replications.

The subgroups were paired thus:
A1 & B1; A2 & B2; A3 & B3 and A4 & B4 the paired groups were properly flooded with different concentrations of used engine oil
Thus: A1 & B1 for 150ml, A2 & B2 for 200ml, A3 & B3 for 250ml as treatments, A4 & B4 was treated with distilled water as control.
The samples were left for three (3) days to enable the oil drain properly inside the planting pots. After which three (3) seeds each of *T. occidentalis* and Z. Mays were planted whole somely into respective pots. Each pot was watered daily at 7.00 am (GMT). Data for seedling heights and number of leaves at 7 weeks after planting (WAP) were processed.

b. **Laboratory Experiment:** Three (3) planting pots labeled X, Y, Z were sand – filled with soil sample collected at the same location as stated above. Various concentrations were poured into them, thus; "X" for 150 ml, "Y" for 200ml "Z" for 250ml they were allowed to drain for three (3) days. Two hundred milligrams (200mg) each of X, Y, Z were then measured out, then poured into three (3) separate beakers labeled X, Y, Z.

Two hundred millilitres (200ml) of distilled water was poured into each of the beakers, properly stirred and left for eight hours (8hrs). After which the solution were then filtered and the filtrates used as aqueous extracts. Distilled water served as control.

Twenty–four (24) sterilized Petri- dishes were double – lined with what-man-No. 1 filter-papers. The Petri- dishes were grouped "A" & "B" for

T. occidentalis and Z. Mays experiments respectively. Three (3) seeds of T. *occidentalis* were placed on each of the Petri – dishes A1, A2, A3, A4 and another three (3) seeds of Z. mays were placed on each of the Petri – dishes B1, B2, B3, B4. The Petri – dishes were arranged in pairs as usual. All the Petri dishes were all moistered for eight (8) days using "X" aqueous extracts for A1 & B1, "Y" aqueous extracts for A2 & B2, "Z" aqueous extracts for A3 & B3. Distilled water for A4 & B4 served as control.

The Petri – dishes were kept at room temperature in a growth chamber where germination measurement were recorded at 24 hrs. intervals, for 8 days. Data obtained from both experiments were compared statistically (t – test, 5% level) against those obtained from the control.

Results and Discussion

Table 1: Mean weekly heights and number of leaves of *T. occidentalis* and Z. Mays early seedling growth on soil treated with different concentrations of used engine oil.

Concentration of used engine oil (ml)	Growth height (cm)								No. of leaves @ 7 WAP
	Species	1	2	3	4	5	6	7	
Control	T. occidentalis Z mays	16.1 5.6	17.6 6.4	19.1 7.2	20.6 8.0	22.1 8.8	23.6 9.6	25.1 10.4	12 10
150	T. Occidentalis Z. mays	7.0 3.2	7.5 3.7	8.0 4.4	8.5 5.1	9.0 5.8	9.5 6.5	10.0 7.2	6 (50) 5 (50)
200	T. occidentalis Z. mays	6.2 3.0	6.7 3.3	7.2 3.6	7.3 3.9	8.5 4.2	9.0 4.5	9.5 4.8	6 (50) 5 (50)
250	T. Occidentalis Z. mays	5.7 2.5	6.0 2.8	6.3 3.1	6.6 3.4	6.9 3.7	7.2 4.0	7.5 4.3	6 (50) 5 (50)

* **Values in Brackets are the % Reductions**

Table 2: Mean daily lengths (cm) of T. occidentalis and Z. mays radicles following different treatments with aqueous extracts.

Aqueous Extracts Treatments (mL)	Radicle length cm /DAP								
	Species	1	2	3	4	5	6	7	8
Control	T. occidentalis z. mays	- -	- -	- -	0.5 2.0	0.7 2.5	1.6 3.0	3.7 3.5	8 4.4
150	T. occidentalis Z. mays	- -	- -	- -	0.3 1.6	0.5 1.8	1.3 2.0	2.2 2.4	4.6 3.4
200	T. occidentalis Z. mays	- -	- -	- -	0.2 0.5	0.3 1.7	1.2 1.9	2.1 2.3	2.6 2.5
250	T. occidentalis Z. mays	- -	- -	- -	0.1 0.4	0.2 1.2	1.2 1.5	1.5 2.1	2.3 3.0

Table 3: Mean daily lengths (cm) of T. occidentalis and Z. Mays plumule following different treatments with aqueous extracts.

Aqueous Extreacts Treatments (mL)	Plumule length cm /DAP								
	Species	1	2	3	4	5	6	7	8
Control	T. occidentalis z. mays	- -	- -	- -	- -	- 1.5	1.6 3.1	2.2 3.7	3.0 4.6
150	T. occidentalis Z. mays	- -	- -	- -	- -	- 0.5	0.8 1.9	1.0 2.0	1.6 2.2
200	T. occidentalis Z. mays	- -	- -	- -	- -	- 0.3	0.6 0.7	1.9 1.4	2.2 1.8
250	T. occidentalis Z. mays	- -	- -	- -	- -	- 0.2	0.5 0.6	1.0 1.2	1.2 1.4

Based on results, both species had better early growth on control than those in the treatments. The growth inhibition increase in the species with increase in the concentration of the pollutants. In table 1 week 1 after planting (WAP) data collected for height (CM) of T. occidentalis in control was 16.1 against 7.0, 6.2, 5.7 treatments in the 150, 200, 250ml concentration.
Similarly, in Z. mays the control was 5.6 against 3.2, 3.0, 2.5 treatments in the 150, 200, 250ml/concentration.

At 7 WAP T. Occidentalis early seedling growth control was 25.1 against 10.0, 9.5, 7.5 treatments in the 150, 200, 250ml/concentration.

Also at 7 WAP Z. Mays early growth control was 10.4 against 7.2, 4.8, 4.3 treatments in the 150, 200, 250ml/concentration. Statistical analyses (t – test, 0.05 level) revealed that there were significant differences in the early seedling growth height in control against treatments in both species.
There were gross reduction in the number of leaves obtained in both species.

At 7 WAP, the mean number of leaves in control was 12 and 10 respectively in both species against 5 and 6 respectively in all treatments. These constitute 50% reductions respectively in all treatments.

Treatments with aqueous extracts derived from oil polluted soils resulted in the inhibitions of the radicle and plumule growths Table 2 and 3 in both species. In both species too, the inhibition increased with the increase in the concentrations.

Thus, the radicle early growth length for T. occidentalis and Z. mays at 8 DAP were 4.4 and 4.6 against 3.4 and 3.5 respectively in 150 ml extracts, 2.6 and 2.5 in the 200 ml extracts, 2.3 and 3.0 respectively in 250 extracts table 2.

Similarly while the plumule length growth of *T. occidentalis* and *Z. mays* were 3.0 and 4.6 respectively at 8 WAP for control against 1.6 and 2.2 respectively in 150 ml extracts 2.2 and 1.8 respectively in 200 ml extracts, 1.2 and 1.4 respectively in 250 ml extracts table 3.

Results obtained from this study agreed with previous assertion Adeinpekun and Kassim (2006) that used engine oil affects plant height, stem girth, moisture content, leaves areas and number of leaves in *Celosia argentea*. A number of researchers had revealed that crude oil inhibits plant growth (cook and Westlake, 1974), reduces germination due toxic effects on seeds (Udo and Fayemi, 1974, Udo and Opara 1984) and leads to decrease in biomass productivity (Amakiri and Onofeghara 1983, Odejimi and Ogbalu 2006). It could be inferred from the result obtained in this study that both the crude oil and used engine oil have similar effects on plants.

Previous studies have revealed that the crude oil penetrates the pore spaces of terrestrial vegetation (Bossert and Bartha 1984) and subsequently impedes photosynthesis and other physiological process of the plant (Odu, 1977, 1981). Plants on such soil becomes suffocated due to the exclusion of air by the oil. (Udo and Fayemi 1999). The exhaustion of Oxygen in the soil increase microbial activity and thus interferes with the plant – soil – water relationship (Esenowo et al; 2006). This affects plants growth on seeds and causes morphological and anatomical aberrations in the leaf, stem and root (Gill et al; 1994).

Conclusion

Oil polluted soils become unsuitable for growth of pants for a long time, until it degrades to a tolerable level (Udo and Opara 1984).

Used engine oil might also exhibit similar effects an plants. Thus, efforts should be made to enlighten all stakeholders on the need to properly dispose of used engine oil within or outside their workshop. Under field conditions farmers should also adhere to certain adaptive method for optimal growth of their crops.

Recommendations

1. Farm crops of such species used as specimen should be increased to five (5). This will enable the researcher to identify species that is tolerant to used engine oils.
2. Such polluted habitats should be left fallow for couple of years to allow the soil re-habilitate.
3. Sabotage on crude oil should be discouraged to avoid spill
4. If spill occurs proper clean up should be made immediately to avoid damaging the vegetation.

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