

Short Communication

Response of African oil bean (*Pentaclethra Macrophylla* Benth) seeds to soils contaminated with spent lubricating oil

O. M. Agbogidi

Department of Forestry and Wildlife, Faculty of Agriculture, Delta State University, Asaba Campus, Delta State, Nigeria.
E-mail: omagbogidi@yahoo.com. Tel: +2347038679939, +2348056306219.

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This study evaluated the response (seedling emergence) of *Pentaclethra macrophylla* seeds sown in soils contaminated with spent lubricating oil using 0, 1, 2, 4 and 8% w/w in Asaba, Delta State in 2009. The results showed that 100% of the seeds sown in the control germinated. Significant reductions ($P \geq 0.05$) were however recorded in seeds planted in the soils treated with the spent lubricating oil. The effects being concentration dependent. The study has shown that spent lubricating oil has a highly significant ($P \leq 0.05$) effect of reducing the germination percentage and rate of germination of *P. macrophylla* as well as increasing the days to germination of this multipurpose tree species.

Key words: Influence, spent lubricating oil, seedly emergence, *Pentaclethra macrophylla*.

INTRODUCTION

Pentaclethra macrophylla is a multipurpose tree from Africa with potential for agro forestry in the tropics (Ladipo, 1984). It is the sole member of the genus occurring naturally in the humid lowlands of West Africa (Aju and Okwulehie, 2005). It is a leguminous tree (family leguminosae; sub-family mimosoideae) and recognized by peasant farmers in the south east of Nigeria for its soil improvement properties (Akindahunsi, 2004). It has been cultivated in Nigeria since 1937 (Ladipo and Boland, 1995). The tree grows to about 21 m in height and about 6 m in girth (Keay et al., 1989). The bark is grayish to dark reddish brown. The compound leaves possess a stout angular petiole. Main flowering seasons is between March and April with smaller flushes in June and November. Fruits are available at most periods of the year because the large woody pods are persistent. Fruits split open explosively with valves curling up. Common uses of *P. macrophylla* include food, salt substitute, edible oil, seed craft, dye, fencing and palings, charcoal, carving bowls, medicine (convulsion, itching, lactogenicity, wound, diarrhea, seed wood and ornamental (Envjiugha and Agbede, 2000; Asoegwu et al., 2006). The spent lubricating oil (waste engine oil) is usually obtained after servicing and subsequently draining used oil from automobiles and generator engines. The disposal of spent oil into gutters, water drains, open vacant plots and farms in Nigeria is a

common occurrence and is mostly done by auto-mechanics and allied artisans with workshops on the roadsides and open places. Some of the spent oils may have foreign substances including synthetic polychlorinated biphenyles and higher concentrations of polyanomatic hydrocarbons (PAHs) and heavy metals (Wang et al., 2000) constituting environmental risks to man, other animals and plants. Oil in the soil according to Atuanya (1987) affects its physical, biological and chemical properties. Used oil is a very serious waste management problem and is dangerous to the environment. Although research works have been conducted on forest tree species using crude oil, information on the response of spent lubricating oil on tree species is scarce. This study has been conducted to evaluate the seedling emergence of *P. macrophylla* seeds sown in soils contaminated with spend lubricating oil.

MATERIALS AND METHODS

The study was conducted at latitude 6°14'N and longitude 6°49'E at the nursery site of the Department of Forestry and Wildlife, DELSU, Asaba Campus, Nigeria (Asaba Meteorological Office, 2009). Seeds discharged by explosive mechanism were collected for 3 consecutive days from the parent tree in Ugbolu in Oshimili North Local Government Area of Delta State. Mechanical scarification followed by soaking in water for 24 h were carried out on the seeds

Table 1. Effect of soil contaminated with spent lubricating oil on the germination characteristics of *Pentaclethra macrophylla*.

Oil in soil (% w/w)	Germination percentage (%)	Days to germination	Rate of germination
0	100.0a	8.0a	4.0a
1	85.6b	10.6b	3.2b
2	62.4c	16.7c	2.9c
4	35.3d	19.3d	1.7d
8	21.0e	27.4e	0.9e

Means in the same column with different letters are significantly different ($P \leq 0.05$) using Duncan's multiple range test.

to enhance seed germination. Soil samples were obtained from the Gmelina plantation behind the departmental nursery as a pooled sample. The soil was air - dried and passed through a 2 mm sieve. The SLO used was from Total Filing Station, Cable Point, Asaba and applied at 0, 1, 2, 4 and 8% w/w (based on weights of oil and soil) . The soil/oil samples were thoroughly mixed together by hand. The mixtures were poured into bottom – perforated polypots (15 x 10 cm in dimension). The seeds were later planted in the polypots, watered to field capacity immediately after planting and subsequently once in two days. The trial was laid out in a randomized complete block design (RCBD) with 4 replications. The polypots were kept in the nursery for subsequent examination. Parameters measured were germination percentage, days to germination and rate of germination. Data obtained were exposed to analysis of variance while significant means were separated with the Duncan's multiple range tests using SAS (2005).

RESULTS AND DISCUSSION

The presence of spent lubricating oil in soil significantly affected germination characteristics of *P. macrophylla* (Table 1). Seeds sown in the uncontaminated soils (control) has the high test germination percentage (100%) and this value was significantly ($P \leq 0.05$) different from those sown in soils contaminated with SLO. 85.6, 62.4, 35.3 and 21.0% were recorded for seeds sown in soils treated with 1, 2, 4 and 8% w/w respectively (Table 1). Similarly, it took *P. macrophylla* seeds sown in the control 8 days to germinate while those seeds sown in soils contaminated with SLO caused a delay in seed germination of *P. macrophylla* (Table 1). The rate of germination of *P. macrophylla* seeds sown in soils without treatment with SLO was 4 but it was 1.7 in soils treated with 4% w/w of SLO (Table 1). These findings are in consonance with the reports of Anoliefo and Edegbei (2000) on *Solanum melongena* and *S. incanum*, Vwioko and Fashemi (2005) on *Ricinus cummunis*, Odjegba and Sadiq (2002) on *Amaranthus hybridus*, Agbogidi and Eshegbeyi (2006) on *Dacryodes edulis* and Sharifi et al. (2007) on six other plant species. The observed significant reduction in the germination potentials of *P. macrophylla* may be attributed to one or a combination of the following factors: poor wettability and aeration of the soil (Agbogidi and Ejemete, 2005), loss of seed viability (Agbogidi and Dolor, 2007), penetration of oil components into the embryo (Gill et al., 1992), nutrient immobilization (Nwadinigwe and Uzodimma, 2005) as

well as effect of the oil on the metabolic activities of the seeds. The presence of toxic oil constituents and heavy metals may not be ruled out as their influences on crop plant are quite enormous (Agbogidi et al., 2007).

Conclusively, this study has demonstrated that soil contamination with spent lubricating oil has significant effects of reducing the seedling emergence of *P. macrophylla*. It also delayed its spouting and reduced the rate of germination.

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