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PERFORMANCE OF *JATHROPHA CURCAS* (LINNEAUS 1753) IN DIFFERENT SOIL MEDIA IN THREE LOCATIONS

Emerhi, E. A.
Department of Forestry and Wildlife, Faculty of Agriculture, Delta State University, Awai Campus

ABSTRACT
The aim of the study was to determine source variation in the germination of *Jatropha curcas* seeds collected from three locations in Delta State in relation to different soil media. A significant seed source variation was observed in seed morphology (colour, size and weight), seed germination (viability, germination percent, germination value) and seedling growth parameters (survival percentage, seedling height, collar diameter, leave/plant, and seedling biomass).The seed source of Ughelli was found as the best source in comparison to others. After 8 weeks planting (8 WAS), data were collected on day of Emergence, height, number of leaves collar diameter, leaf area and the data was subjected to analysis of variance (ANOVA) while the significant means were separated with fisher's least significant difference (LSD). The result shows that *Jatropha curcas* seedlings thrives well in any type of soil, but in the germination, the river sand had the highest germination performance (1.47), followed by sandy soil(1.07),clayey soil (0.87) and loamy soil had the lowest germination performance (0.68).The result indicated that river sand soil has best potential ability for establishing *Jathropha curcas* nursery.

KEY WORDS: *Jathrophacurcas,* Seed Source, Soil Media, Germination and Biodiesel.

INTRODUCTION

According to Baroi *et al*. (2009) The need to meet the increasing global demand for energy while addressing climate change concerns has provided an impetus for research into the production of biofuels. At present, the United States and Europe are world leaders in biodiesel production. The United States depends mainly on soybean for biodiesel production, while Europe depends on rapeseed. Other traditional feedstocks are canola oil, sunflower oil, palm oil and coconut oil, all of which are food sources (Baroi *et al*. (2009). Kamal *et al*. (2008) has noted that the world food crisis could be as a result of the utilization of food crops in producing biofuels. Human rights activists have called for a ban on the production of biodiesel from food crops for several years. On the other hand, Baroi, *et al*. (2009), has noted that waste cooking oil and tallow from animal fats can be alternative feedstock's for biodiesel production, but that large scale biodiesel production from these sources may not be possible because of the lack of continuous and sufficient supply of these types of feedstock. So, there is the need for an alternative biodiesel feedstock that is inexpensive, inedible and meets all the criteria for biodiesel feedstock.

In this regard, *Jatropha curcas* oil, inedible tropical plant oil has tremendous potential for biodiesel production. Jatropha oil has low acidity and good oxidation stability compared to soybean oil, low viscosity compared to castor oil and better cold properties than palm oil (Tapanes *et al*., 2008). The *Jatropha curcas* plant has been referred to as the second generation cropping solution for biofuel production (Gressel, 2008). Though the land requirement of third generation biofuel feedstock (for example, algae) was much less, the production of biofuel from these third generation feedstocks is much more complex than from the second generation feedstock (*Jatropha curcas*). Moreover *Jatropha curcas* grows in waste land, which makes it a more attractive feedstock for biodiesel production. *Jatropha curcas* is drought-resistant oil bearing multipurpose shrub/small tree which belongs to the family of Euphorbiaceae (Staubmann *et al*., 1999; Ackom and Ertel, 2005; Achten *et al*., 2006). It originates from Central America and was distributed by Portuguese seafarers via the Cape Verde Islands to countries in Africa and Asia (Henning, 2000). These days Jatropha is widely grown in Mexico, China, north-east Thailand, India, Nepal, Brazil, Ghana, Mali, Foso, Zimbabwe, Nigeria, Malawi, Zambia and some other countries (Ackom and Ertel, 2005; Openshaw, 2000). There are 175 species of Jatropha around the world (Becker and Makkar, 2008). Jatropha grows in arid and semi arid climates and in a wide range of rainfall regimes, from 200 to 1500 mm per annum (Achten *et al*., 2006). It can survive in poor stony soils (Aderibigbe *et al*., 1997). The plant can be grown in arid waste land with high degree of acidity (Gadeker, 2006). It was used as wind break, live fencing as the seeds are poisonous (contains toxalbiumcurcin) to human beings, animals and as well as protection against erosion caused by rain water (Umar, 2006).

Jatropha is a valuable multi-purpose crop used in alleviating soil degradation, desertification and deforestation; the plant grows quickly forming a thick bushy fence in 6-9 months, up to a height of 4 m with thick branches in 2-3 years and the branches contain latex (Henning, 2000; Augustus *et al*., 2002). The life span of the *Jatropha curcas* plant is more than 50 years (Henning, 2000). Almost all parts of the plant have a medicinal value (Staubmann *et al*., 1999). The bark is rich in tannin and also yields a dark blue dye. The tender green leaves are fed

to silk worms, for small scale silk production (Augustus *et al*., 2002). In many countries Jatropha was planted in the form of hedges to protect gardens and field crops from roaming animals. Since Jatropha plants have lateral roots near the surface, they can be used to fix small earth dams which reduce the flow of run-off water (Henning, 2000). Its seeds resemble castor seeds in shape, but are smaller and brown (Augustus *et al.*, 2002) and have an annual seed yield of 5 tons per hectare (Aderibigbe *et al*., 1997). Estimation showed that the seeds contain 30-32% protein and 60-66% lipid (Augustus *et al.*, 2002). The oil content of the seeds varies from 30 to 60% depending on the variety, place and the method of oil extraction. The seed and /or the oil have been found to be toxic, so the oil cannot be used for cooking purposes and the cake remaining after extraction of the oil from the seed cannot be used as cattle feed or for any edible purpose. The cake contains about 6% N, 3% P, and 1% K. But the oil has an excellent fuel property.

Jatropha curcas is a prominent species with wide variety of uses. Seeds, leaves and bark are used in traditional medicine and for veterinary purposes. The oil has a strong purgative action and is also widely used for skin diseases and to soothe rheumatic pain. A decoction of leaves is used against cough and as an antiseptic after birth (Heller, 1996).The oilcan also used in soap and candle industries and its by-product glycerine can be used in the pharmaceutical industry.

According to Yammama, (2010) In Nigeria, farmers intercrop Jatropha with other plants like maize and cassava in between the Jatropha trees, so he does not have to look for another land to plant. The reasons behind intercropping strategy are essentially risk spreading in the event of adverse weather, although crops can also benefit from plant shadowing effects, and 'natural' disease and pest control. A combination of certain selected food crops and Jatropha might have positive overall impacts on yields and farmer income. Intercropping is successful in Nigeria. Intercropping also provides farmers with a form of insurance against crop failure. The growing period of one crop is usually different from that of the other, so if the rains are late for one crop and reduce its growth they may arrive in good time for the other crop. Jatropha has potential for controlling soil erosion and increasing the habitat for wild animals." It does not require any particular soil type for growth and can flourish on almost any soil composition. Its oil yield in Nigeria is above 40%. Nigeria has ample availability of economic, deforested and large chunks of waste landmass which can be utilized for the Jatropha cultivation.

Various banks and government agencies offer several incentives for *Jatropha* cultivation, compared to other vegetable oils like palm oil and sunflower oil, which are expensive. *Jatropha* can also help to increase rural incomes, self-sustainability and alleviate poverty for women, elderly, children and men, tribal communities, small farmers and agro-industries (Umar, 2006).

The objective of this study is to investigate the *Jatropha curcas* seeds, germination and seedling growth under different soil media.

ECONOMIC IMPORTANCE

Jatropha as biodiesel tree and renewable fuel tree may support economic recovery and encourage economic growth in rural areas. When planted in large quantity, it will act as carbon sink thereby mitigating the impact of climate change. The rapid development of the global biodiesel industry has been closely observed by countries interested in stimulating economic growth, improving the environment and reducing dependency on imported oil. Developing biofuel resources represent the most immediate and available response to four key challenges and opportunities.

i. Coping with depleting oil reserves
ii. The need for oil-importing countries to reduce their dependence on a limited number of exporting nations by diversifying their energy source and supplies.
iii. To challenge emerging economies in tropical regions to supply the global energy market with competitive price liquid biofuel.
iv. Meeting growing energy demand in developing countries, in particular to support development in rural areas (Birgit, 2006).

The seeds are orthodox and should be dried to low moisture contents (5-7&) and stored in air-tight containers. At room temperature the seeds can retain high viability for at least one year. However, because of the high oil content the seeds cannot be expected to store for as long as most orthodox species (Agboola and Adedire, 1998).

MATERIALS AND METHODS

The experiment was conducted at the Department of Forestry and Wildlife, nursery of Delta State University, Asaba. The university is located between Latitude 6^{o}14'N and Longitude 6^{o} 49'E. Asaba is located in the tropical climate region with a mean annual rainfall of 1500- 1847. 3mm, mean annual temperature of 23.8^{o}C, mean humidity of 77.2% and monthly sunshine of 4.8 bars (Awai, 2009). The seeds of *Jatropha curcas* were collected form mother trees in three different locations, A-Asaba (Awai), B-improved seeds from outside Nigeria, and C-Ughelli in the central part of Delta State. The seeds were sown directly into poly pots filled with 1.7kg weight of different soil media. The experiment was set up in a Split plot design with five replicate and data was collected on Day of Emergence, height, number of leaves collar diameter and leaf area. Data collected were subjected to analysis of variance (ANOVA) while the significant means were separated with fisher's least significant difference (LSD).

RESULTS

The results from table 1 shows that there was no significant differencebetween the soil media on the height, Collar diameter,Leaf area and Leaf number of *Jatropha curcas* seedlings.

TABLE 1: Effect of soil media onthe parameters assessed on*Jathropha* seedlings

Soil media	Height	Collar diameter	Leaf area	Leaf number
Clay soil	10.50[a]	0.56[a]	36.25[a]	4.73[a]
Loam soil	9.50[a]	0.44[a]	39.93[a]	3.90[a]
River sand	10.64[a]	0.54[a]	33.06[a]	4.60[a]
Sandy soil	10.18[a]	0.50[a]	39.38[a]	4.07[a]
LSD	NS			

Means of the same column with different letter are significantly different at P ≤ 0.05) using the fisher leas significant difference

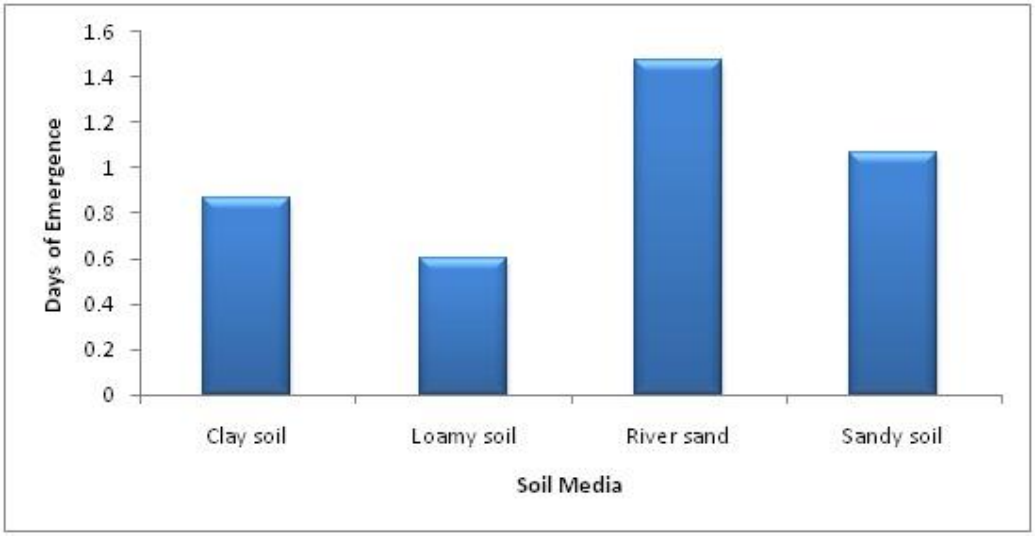

FIGURE 1: Effects of soil media on the days of emergence

From the Figure 1, it was observed that the germination of *Jatropha curcas* seed collected from the ughelli has the highest performance of germination and improved variety has the lowest performance of germination from the Figure1, it was observed that the germination (days of emergence) of *Jatropha curcas* seeds was highest with river sand at 1.47 days, followed by sandy soil at 1 day emergence, with Loamy soil having the lowest days of emergence of 0.60 days. This result agrees with pervious work by Gradeker, (2006) on the resistant of *Jatropha curcas* on a high degree of aridity. the reason could be as a result of the pore spaces in the soil which gives room for the passage of air flow, and the heating nature of the sand, which makes the germination occur more easily and rapidly.,

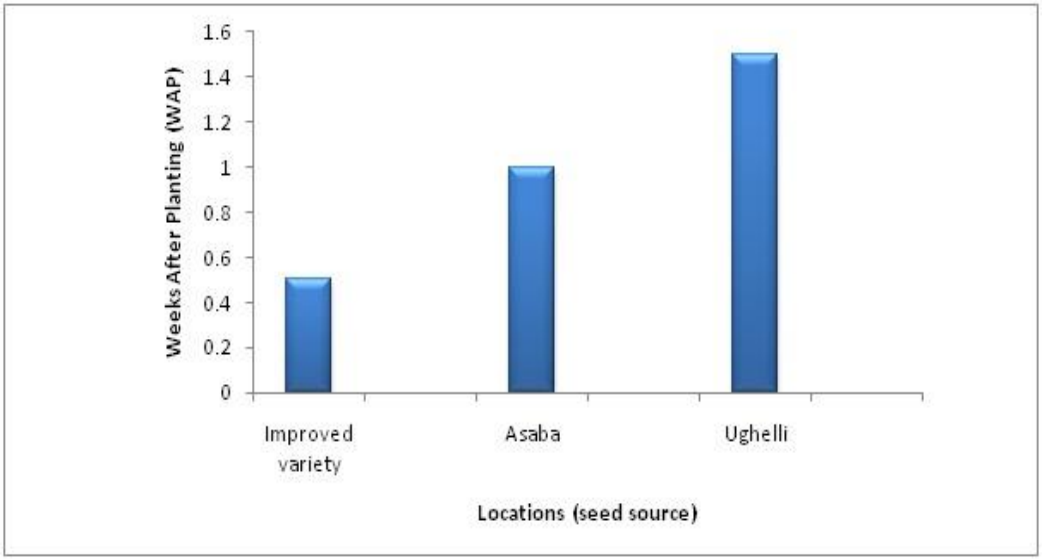

FIGURE 2: Effects of different seed source locations on germination weeks after planting

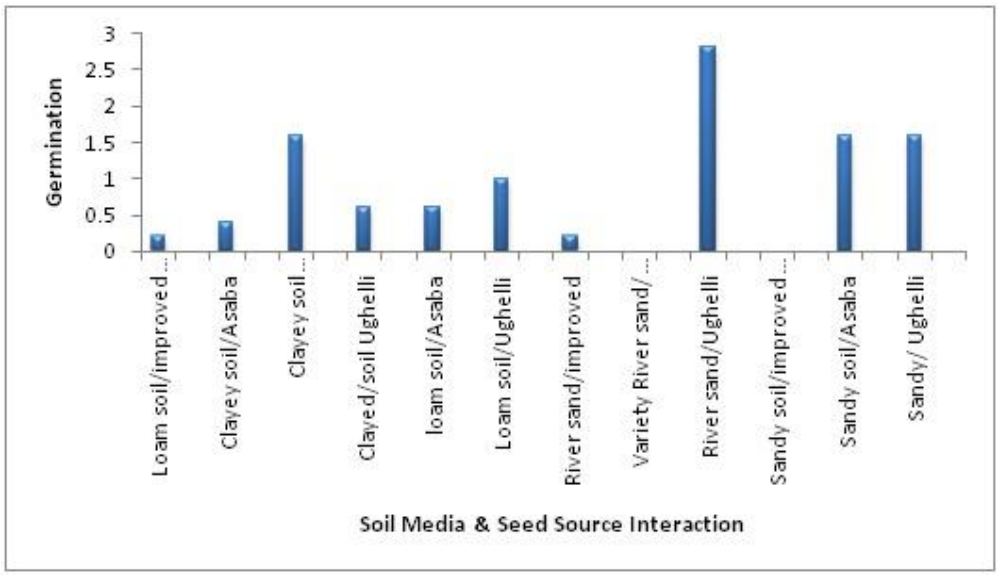

FIGURE 3: Effects of soil media & seed source on the germination of *Jatrophacurcas* seeds

The figure3 above show the interaction between soil media and seed source on the germination of *Jatropha curcas* seeds, it is observed that seed source form Ughelli planted with river sand has the highest germination performance mean value of (2.80), followed by seed source form Asaba, improved variety and seeds from Ughelli planted with sandy soil and clayey soil has germination performance mean value of (1.60) while seed sources planted with loamy soil has lowest germination performance.

DISCUSSION

The study was done to examine the use of different soil media to test for the suitable soil for the germination of *Jatropha* seeds for the nursery establishment Delta State. The result shows that *Jatropha curcas* seedlings thrives well in any type of soil, but in the germination, the river sand gave the highest germination performance with the seeds that were collected from Ughelli location with mean value of (2.80) in terms of days of germination. The result also shows that loam soil with the seeds collected from Ughelli has the highest leaf area with mean value (69.95cm) clay soil with the seed collected from Ughelli has the highest seedling height (plant height) with mean value (17.98) and seedlings collar diameter with mean value (0.93) respectively. The shows that irrespective of location, the four soil media, properly managed will improve *Jatropha curcas* seedlings performance hence they may be considered as a media for raising *Jatropha curcas* seedling at the nursery stage.

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