International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2015): 6.391

Evaluation of Three Varieties of *Jatropha curcas* L. for Nursery Establishment in Port Harcourt, Rivers State, Nigeria

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Abstract: ***Field experiment was conducted from May to August, 2016 at the Rivers State University Teaching and Research farm to evaluate the establishment of three varieties of Jatropha curcas from Ilorin, India and Lafiagi respectively in the nursery using their seeds. Results show that the seeds of the three varieties took 6-8 days to achieve 100% germination as against 10-12 days as reported by literature. The results further revealed no significant differences (P>0.05) among the three varieties in plant height. India and Lafiagi varieties had the highest plant height of 25cm while Ilorin had 24.90cm at 12 WAP. The leaf area result showed that India variety had the broadcast leaves (288.6cm^2) followed by Ilorin (258.0cm^2) and Lafiagi with 204.4cm^2 leaf area. The significance of the leaf area could be shown in the production of dry matter and fruit development of the plant cultivar. The number of leaves was not statistically significant from 2 to 8WAP. However, they manifested significant differences (P<0.05) at 10 and 12 WAP, with Lafiagi (8.80) and (11.50) respectively being statistically different from Ilorin (7.50) and (8.50), India (7.50) and (8.00) varieties respectively. It can be noted here that leaf area coupled with leaf number, is vital for the production of plant fruits through the assimilation of light for photosynthetic activities. In our circumstance, the three varieties can easily be adapted into our environment for J.curcas establishment and production.***

Keywords: *Jatropha curcas* seed from Ilorin, India and Lafiagi, nursery establishment.

1. Introduction

In *Jatropha curcas* production, sexual and vegetative propagation technologies are employed. Sexual propagation involves using seeds which are free from diseases and pests whereas vegetative propagation technology involves the use of stems that are also free from any impediment such as diseases and pests.

J.curcas is an oil plant commonly known as physic nut or nutmeg plant that is drought resistant, multipurpose large shrub or small tree. According to Adekola *et al.* (2010), it originated from tropical America from where it spread to different countries throughout Africa and Asia and takes 10-12 days to germinate. As a drought resistant plant, *Jatropha* can be found growing wild on uncultivated lands in most parts of Africa and could be used as hedge plant. The plant is considered as the best source of bio-fuel production among various plant-based fuel resources in the world (Tint and Mya, 2009).

Jatropha fruit is made up of green epicarp, fleshy mesocarp and hard endocarp. It grows as a small shrub reaching the height of between 3 and 5 meters with the bark exuding white coloured latex. The leaves are arranged alternatively with green to pale green colour. The flowers are terminal and the fruits produced during dry season. At maturity, the fruit capsule changes colour from green to yellow (Adekola *etal.*,2010). Accordingly, the*Jatropha*plant can be found in diverse climatic zones: in tropical and sub-tropical regions of the world and in low rainfall areas and problematic sites.

The discovery of *Jatropha* as an energy crop or source of bio-fuel would if properly researched on, serve as an alternative to fossil fuel that has caused so much environmental damage to the world (Belewa *et al.*, 2010)and will reduce the dependence on fossil fuel with significant environmental benefits without interfering with food crop production.

Despite the fact that *J. curcas* can be used as a source of bio-fuel, it has other multipurpose uses. The detoxified and properly prepared kernel cake could be used to replace most conventional feedstuff- the groundnut cake, soybean cake and cotton seed cake etc. because of its high nutritive values (Gross *et al.*, 1997).

In our localities, our grandparents used *Jatropha* in the treatment of different ailments such as malaria and constipation. The oil extracted from the seed is used as insecticide and the pressed cake used as organic manure. Anonymous (1991) explained that *J. curcas* is of immense benefit to the building up of soil carbon and can help in alleviating soil degradation, deforestation, desertification and live fencing.

J.curcas seed contain about 50% by weight viscous oil, which can be used in candle manufacture and soap-making in cosmetic industries, for cooking and lightening or as a diesel or paraffin substitute or extender (Jones and Millers, 1992). As a perennial drought-resistant economic shrub, *Jatropha* can increase plantation and agro-industrial income, thereby creating employment, by products for industries and income from foreign exchange.

Jatropha according to Smith and Heard (2003) has its own fair share of attack from pests and diseases including weed encroachment at the early stages of growth when the plant is still juicy and succulent in nature. They further reported that the identified pests of *Jatropha* include beetles, grasshoppers and leaf miners.

From the foregoing therefore, the objective of this paper is to evaluate the nursery establishment of three cultivars of *J. curcas* in Nkpolu Oroworukwo, Port Harcourt Rivers State, Nigeria.

2. Materials and Methods

Research site: The research was conducted in the 2016 cropping season at the Rivers State University Teaching and Research farm located on 4^{o} 5North and 7^{0} 0 E on an elevation of 17.34m above sea level. Nkpolu Port Harcourt, Rivers State is in the high rainforest zone extending into the mangrove forest of Nigeria.

Materials: Three cultivars of *J.curcas* seeds were procured from Lafiagi; Ilorin, Kwara State and India. Nursery polythene bags, perforators, sweep nets, bowls, Knapsac sprayers, sample bottles, ethanol and formalin solution were produced for the research.

Land preparation and experimental design: The site was cleared using machetes, spades and rakes and a space of 20x20m were stumped. The top soil in the nursery site was used to mix with poultry cured manure and bagged, then left for eight days to settle after which the nursery bags were perforated to enable aeration. A Completely Randomized Design (CRD) was used with three replicates.

Thereafter, the *Jatropha* seeds were planted in the nursery.The seeds were planted one seed per bag and there were 50bags per replicate arranged in 10 rows and 5 columns. The three test seed materials from India, Lafiagi and Ilorin were planted in three replicates and observed over the period of the experiment, May-August, 2016.

Weeding: Weeding was done at intervals of one week to avoid weed competing for nutrient with the young crop seedlings. Weeding also helped to reduce pest attacks because weeds serve as host to insect pests. Weeding was done manually with the use of hand hoes.

Neem Extract Preparation: Neem seeds were collected from the staff quarters in Rivers State University, Nkpolu. The seeds were air dried under shade for three days before weighing and crushing. The crushed neem seeds of 15g were weighed out and soaked in 1 litre of water for 24hours. The crushed and soaked neem seeds were then filtered using muslin cloth. The filtered extract was applied on the plots from the week after germination at weekly intervals for insect pest control.

Pest Control: The insect pests such as grasshoppers (*Zonocerus variegatus*),whiteflies (*Bemisiatabaci*),black ants (*Formica rufa*) etc were controlled using the application of neem seed extract.The application of the neem seed extract was repeated periodically.

Data Collection

Percentage germination: The Ilorin seed had 80% germination at 6days after planting while India and Lafiagi varieties had 70% germination respectively. On the 8^{th} day after planting, all the seeds from the three different varieties achieved 100% germination.

Plant Height: Plant height was determined by selecting 25 plants from each replicate of the three different varieties and measured with a measuring tape. This was repeated at two weekly intervals upto the 12^{th} week after planting (i.e 2,4,6,8,10,12 WAP). The mean plant height was taken, calculated and recorded in cm.

Plant Leaf Area: The plant leaf area was achieved by sampling 25 plants selected from each replicate of the different varieties of *J.curcas* and their measurement taken with the aid of graph sheets. The measurements were taken three times at 4-weekly interval up to the 12^{th} week after planting i.e (4, 8 and 12 WAP). The means were calculated and recorded in Cm^2.

Number of leaves per plant: The numbers of leaves per plant were collected from sampling 25 plant seedlings selected from the replicate of the different *J. curcas*. The leave number count was done at two-weekly intervals starting from 2WAP-12WAP.

Data Analysis

Data collected were analyzed using the analysis of variance (ANOVA) and means were separated using the least significant difference (LSD) according to Wahua (1999).

3. Results and Discussion

Seed germination of *J. curcas*: Results of seed germination showed that germination started on the 6^{th} day with the Ilorin variety having 80% while the seeds from India and Lafiagi had 70% germination respectively. However, on the 8^{th} day, all seeds of the three cultivars; Ilorin, India and Lafiagi attained 100% germination respectively. This disagreed with Adekola *et al.* (2010), who reported that *J. curcas* seeds germinate within 10-12 days under favourable conditions. The differences may be due to locational and environmental differences. Adekola *et al.* (2010) had also reported that the performance of seedlings under intensive care depends on the growing area. Furthermore, the early germination of the seeds could be attributed to the freshness of the seeds. Dupziez and Deleamer (1989) pointed out that the duration of germination capacity varies with species and variety, stressing the power of seeds survivability under adverse condition. Obiefuna *et al.* (2010) emphasized that seed provides the method of self-multiplication, regeneration and perpetuity, and also seeds provide survival mechanisms in adverse short and long term environmental conditions.

Plant Height of *J. curcas:* Results of the plant height of *J. curcas* showed that there was no significant difference ($P<0.05$) between the three varieties of the plant. At 2WAP, the mean plant height of *Jatropha* was 10cm for Ilorin variety while India and Lafiagi had 9.80 and 9.20cm respectively. At 6WAP, all the three varieties had a plant

height of 12.50cm (Table 1). Finally, at 12WAP, apart from the Ilorin variety that had a plant height of 24.90cm, the other two from India and Lafiagi had 25cm each and they were all not different statistically. This could be as a result of the environment (Adekola *et al.*, 2010) or their genetic makeup.

Table 1: Mean Plant Height of the Three *J. curcas* varieties at 2,4,6,8, and 12cm weeks after planting.

Varieties	2	4	6	8	10	12
Ilorin	10	11	12.5	15.2	19.5	24.9
India	9.8	10.9	12.5	15.5	20	25
Lafiagi	9.2	11	12.5	16.1	20.15	25
LSD (0.05)	ns	ns	ns	ns	ns	ns

LSD ns represent not significant means

Leaf area of *J. Curcas:* The results of the leaf area as represented in Table 2 showed that there were statistically significant differences between the three varieties. At 4WAP, Ilorin variety had 198.5cm^2 with significantly larger leaf area than Lafiagi variety with 123.0cm^2 but not significantly different with 188.5cm^2 leaf area of India variety.

Table 2: Mean Leaf Area Assessment of the three *Jatropha* varieties at 4, 8 and 12weeks after planting (cm^2).

Varieties	4	8	12
Ilorin	198.5^a	211.3^a	258.0^b
India	188.5^a	228.50^a	288.6^a
Lafiagi	123.0^b	108^b	204.40^c
LSD(0.05)	20.45	19.75	20.95

Mean with same letter are not statistically significant (P>0.05)

The experimental result also revealed strong significant differences among the three varieties of *J.curcas*at 12WAP.The India variety with a leave area of 288.6cm2 was significantly different with Ilorin (258.0cm^2)and Lafiagi (204.40cm^2). The development of the leaf surface and production of dry matter in plants is the product of efficiency of radiation conversion. As the leaves are arranged alternatively, they can easily form a canopy and attract more light for photosynthetic activities.

Number of leaves per plant: The results of the experiment on mean number of leaves (Table 3) showed that from 2WAP to 8WAP, there were no significant differences among the three *Jatropha* varieties.However, at 10WAP and 12WAP, the number of leaves showed some significant differences, with the Lafiagi variety attaining the highest leave number of 11.5 which was statistically different from the Ilorin and India varieties (8.5 and 8.0) respectively. The observation at 10 and 12WAP could be as a result of variations in genetic makeup of the different varieties (Anonymous, 1999).

Table 3: Mean number of *Jatropha* leaves at 2,4,6,8,10 and 12weeks after planting

Varieties	2,	4	6	8	10	12
Ilorin	3.5	4.5	6	7	7.50^b	8.50^b
India	3	4.5	5.5	6.5	7.50^b	8.00^c
Lafiagi	2.5	3.5	5.6	6.7	8.80^a	11.50^a
LSD(0.05)	ns	ns	ns	ns	1.1	2.42

Mean with same letter are not statistically significant (P>0.05) while ns for LSD represent not significant.

4. Conclusion

From the experiment carried out, *J. curcas* was observed to be a fast growing and succulent plant at the early stage of growth before maturity. It is very worthy to note that this study revealed a 100% mean germination of 6-8 days for the three studied varieties of *Jatropha* as against 10-12 days as reported by literature. The results further revealed no significant differences among the three varieties in plant height. Although, the India variety had the largest leaf area followed by Ilorin and least with Lafiagi.It is therefore evident that *J. curcas* can be grown in Port Harcourt, Rivers State and its environs. The three varieties can be easily adapted into the study environment.

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