International Journal of Research
Available at https://edupediapublications.org/journals
p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 03 Issue 09
May 2016

Comparative Study of Propagation Methods on the Early Growth Rate of *Moringa Oleifera* (Lam.)

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ABSTRACT
This study examined the best propagating method for Moringa oleifera (Lam.). This was conducted at the Department of Forestry and Natural Environmental Management arboretum, University of Uyo, Akwa Ibom State, Nigeria. Seeds and stem cuttings of the species were collected from a mother tree located at Obio Ibiono and sown in polythene bags filled with soil from the arboretum and watered twice daily throughout the study period. Daily germination of the seedlings was recorded for fourteen (14) days. The early growth rate was assessed three (3) months after sowing using height, number of leaflets and stem collar diameter as parameters. Data collected were analyzed using t- test at 5% probability level. Results revealed that seeds of Moringa oleifera (Lam.) germinated faster than sprouting from stem cuttings and seedlings raised by seed had mean height (43.92cm), mean leaflets number (69.6) and mean steam collar diameter (0.54 cm) that where higher than those produced by stem cutting, thus indicating that seedlings produced by seeds have a faster early growth rate than seedlings produced by stem cuttings.

INTRODUCTION

In recent time, there has been renewed interest in the utilization of multipurpose trees for rural development and livelihood (Hassan and Ibrahim, 2013) and one of such trees is *Moringa oleifera* (Lam.). The variety of products that can be obtained and the number of uses this tree can be put have pushed it to the forefront of rural development (Fulie, 1999). *Moringa oleifera* is commonly called horseradish tree, mother best tree, the miracle tree, the drumstick, Moringa and host of other names depending on the understanding of this multipurpose tree (Fahey, 2005). It is one of the world's most useful plants cultivated for its leaves, roots, steams and fruits for varieties of food and medicinal purposes (Hassan and Ibrahim, 2013; Fuglie, 1999). The immature seed pods called drumstick are parboiled and cooked in a sauce and consumed in south Asia (FAO, 1999). The leaves with flowers are cooked and used like spinach in West Bengal (FAO, 1999). Mature seeds yield edible oil called "ben oil" which is used as biofuel (Rashid *et al*. 2008). This study is therefore aimed at comparing the propagation methods of seed and stem cuttings on the early growth rate of this multipurpose tree species with the goal of recommending the most effective method of propagating the tree to meet the demand of the people.

METHODOLOGY

Study Area

The experiment was carried out in the Department of Forestry and Natural Environmental Management, University of Uyo Annex, Town Campus, Uyo. Uyo is located on Latitude; 4° 58 - 5° 05'N; Longitude 7°45' - 8° 00E in Ak,wa Ibom State, Nigeria with a mean temperature of 29° C, mean rainfall of 3000 mm and a mean relative humidity of 75%. The state is located in the rainforest agro-ecological zone and covers an area of 15,750 hectares.

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Collection of planting stocks

Mature seeds and stem cuttings of *Moringa oleifera* (Lam.) were collected from a mother tree located at Obio Ibiono, Ibiono Ibom Local Government Area, Akwa Ibom State, Nigeria.

Samples preparation for planting

The collected seeds were subjected to viability test by flotation. Eighty (80) tested seeds (Group A) and eighty stem cuttings (Group B) of Moringa were planted. The seeds were planted with seed coats and the stem cuttings were 30cm each in length. The planting was done in polyethene bags of 24cm in height and 25cm in circumference. The polythene bags were filled with top soil from the Department of Forestry and Natural Environmental Management Research Arboretum and watered twice daily throughout the study period. The number of daily germination of the seedlings was recorded for fourteen (14) days. The early growth rate was assessed three (3)months after emergence using the following growth parameters:

i. Height, using a meter rule
ii. Number of leaflets by direct counting
iii. Stem collar diameter using a veneer caliper

Data analysis

Data obtained were analyzed using descriptive statistics, correlation and t-test at 5% probability level.

RESULTS AND DISCUSSION

The germination rate of the two propagation method used to raise *Moringa Oleifera* seedlings is indicated in Figure 1. Germination was highest (15) in seeds in the third day and the fifth day (7) in stem cuttings. Seedlings germination and emergence from the seeds commence from the first day of germination and lasted till the sixth day, while in stem cuttings, germination and emergence of the seedlings commenced from the fourth day until the fourteen day after planting (Figure 1). However, propagation through seed had a higher percentage of emergences (77.5%) than propagation by stem cuttings (67.5%), although not statistically significant (Table 1).

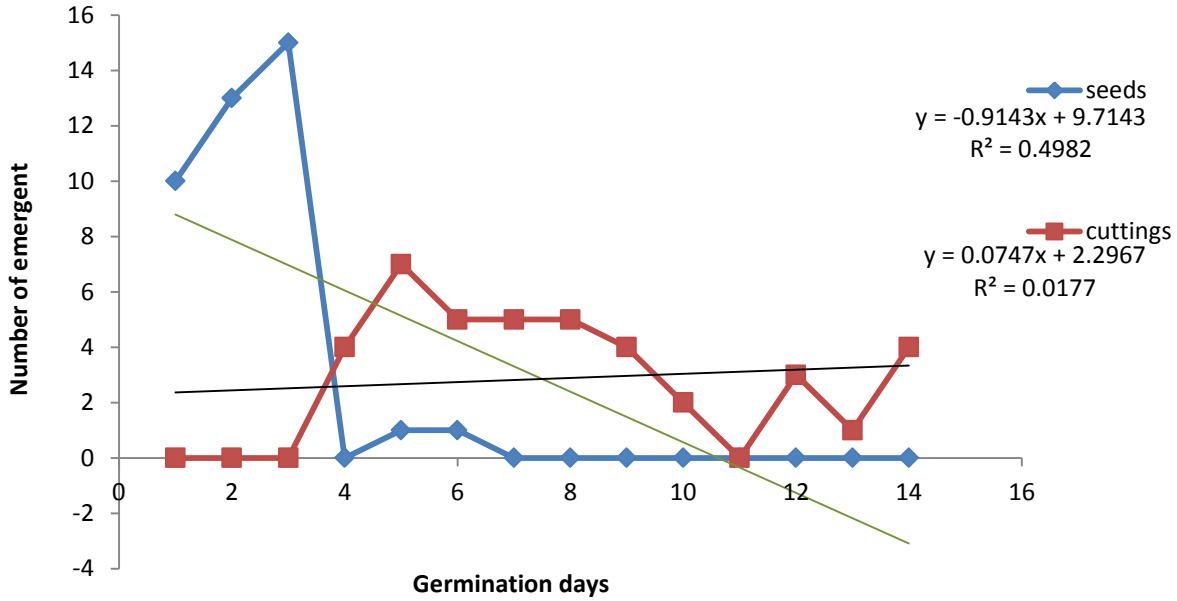

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Figure 1: Daily germination and emergence rate of Moringa oleifera under two propagation method.

Table 1: Emergence Rates

Propagation method	Number propagated	Number of emergent	Germination percentage (%)	T_{cal}	Sig.	r
Seeds	80	62	77.5	0.4852	ns	-0.5902
Stem cuttings	80	54	67.5			

Growth parameters

The result in Table 2 below shows the mean estimate of growth parameters assessed from *M. oleifera* under two propagation methods. The result shows that there is significant difference in mean height between both propagation methods and seedlings produced by seeds have a higher mean height (43.92cm) than stem cuttings (4.28cm). Also, there is significant difference in number of leaflets between seedling raised by seeds and stem cuttings as seedlings raised by seeds have higher mean number of leaflets (69.6) than those raised by cuttings which have mean leaflet number of 24.9. However, there is no significant difference in stem collar diameter (Table 2) of the seedlings under the two propagation methods, although seedlings produced by seeds have a mean stem collar diameter (0.54cm) higher than seedlings produced by stem cuttings (0.40cm).

Table 2: Mean Estimate of Growth Parameters

Growth parameter	Propagation method	Mean estimate	Significant level
Seedling height (cm)	Seeds	43.92	Significant
	Cuttings	4.27	
Number of leaflets	Seeds	69.60	Significant
	Cuttings	24.90	
Stem collar diameter (cm)	Seeds	0.54	Not significant
	Cuttings	0.40	

DISCUSSION

Germination Rate

Seedlings raised by seed had higher mean germination than seedlings raised by cutting. This implies that seeds were more viable than stem cuttings. It also implies that seeds break dormancy and germinate under optimum environmental conditions faster than stem cuttings. The non uniformity in germination and sprouting could have been as a result of conditions both within and outside the embryo of the planting material. These conditions include: Impervious or hard seed coat and stem barks which are impermeable in water, leaching of chemical which inhibits germination and sprouting, morphological characteristics which inhibits both differentiation and growth of the embryo, physiological factors, which prevent the embryo from generating enough power to break through the seed coat, stem bark, endosperm or other covering structures and combined factors, which affect the radical (root) and plumule (shoot) growth.

Seedling height

Seedlings produced by seeds had higher mean height than seedlings produced by stem cuttings. Height growth according to Nwoboshi (1982) is

governed by genetic climatic and edaphic factors. Since the seeds and stem cuttings were raised under the same climatic and adaphic factors, it therefore implies that their difference in height is as a result of differences in their genetic makeup. Consequently, since seedlings produced by seeds had higher mean height than seedlings produced by stem cuttings, it could be said that seeds have better genetic makeup than stem cuttings. Differences in height of the seedlings could also be attributed to the physiological capabilities of the seedlings. Height growth depends on photosynthesis and respiration as they provide the energy needed for growth. This conforms to Nwoboshi (1982), who stated that tree growth and development revolves around carbohydrate manufacture and utilization. From the foregoing, it means that seedlings raised by seed possess high physiological ability than seedlings raised by cuttings.

Number of leaflets

Seedlings produced by seeds had higher mean number of leaflets than seedlings produced by cuttings. This might have been as a result of susceptibility of the seedlings to attack by defoliators and nutrient deficiency. Seedlings raised by seeds could be said to be more tolerable or less susceptible to defoliators attack and develop new leaves rapidly than seedling raised by stem cuttings that are less tolerable or more susceptible to defoliator attacks and develop new leaves slowly.

Stem-collar diameter

Seedlings produced by seeds had higher mean stem collar diameter than seedlings produced by stem cuttings. Nwobushi (1982) stated that the differences in photosynthesis and respiration are seen in diameter growth. The higher the rate of photosynthesis over respiration, the higher the diameter growth and the lesser the rate of photosynthesis over respiration, the lesser the diameter growth in plants will be. The differences in the stem collar diameter of the seedlings could be said to be the difference in their rate of photosynthesis and respiration since the mean stem diameter of seedlings produced by seeds is higher than that of stem cuttings, it implies that, the rate of photosynthesis over respiration is higher in seedlings produced by seeds while it is lesser in seedlings produced by stem cuttings.

CONCLUSION AND RECOMMENDATION

Comparative study of propagation methods on early growth rate of *Moringa oleifera* (Lam.) has discovered that seeds of moringa emerge faster than sprouting from stem cuttings. Seedlings produced by seeds are more vigorous and have faster early growth rate in terms of height, number of leaflets and stem collar diameter than seedlings produced by stem cuttings which are fragile and grow with less vigour. With the vast product from *Moringa oleifera*, identified to meet the health, nutritional and environmental needs of humans, coupled with unavailability of this species in wild, due to forest destruction, it therefore becomes necessary to intensify the planting of this miracle tree in plantations and around homes.

RECOMMENDATIONS

From the research, the following recommendations are made;

i. Raising of *Moringa oleifera* (Lam.) should be done through seeds, since seeds have fast emergence rate and better early growth rate than stem cuttings.
ii. After collection, the moringa seeds should be sorted and tested for viability before planting to avoid failure.
iii. The seeds should be subjected to pre-germination treatment by soaking in water to break dormancy.
iv. *Moringa oleifera* should be planted in homes and forms in order to savour the numerous benefits abound in this species

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