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EFFECT OF WATERING REGIME ON THE GROWTH POTENTIAL OF *Rothmannia longiflora* SALISB

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ABSTRACT

The study examined the effect of watering regime on the growth potential of Rothmannialongiflora by varying watering on the growth of R. longiflora seedlings at nursery stage. The experiment was laid down on completely randomized design with four watering regimes (once daily, twice in day, weekly and fortnightly) were applied to the seedlings. The treatments were subjected to varying volumes of water (50 ml, 100 ml, 150 ml, and 200 ml). The growth parameters were assessed weekly for a period of (12) weeks were plant height, stem diameter, number of leaves. The data collected were subjected to analysis of variance (ANOVA) at 5% level of significance.Result showed that height of seedlings varied between 22.2 cm and 12.45 cm. Watering done fortnightly with 100 ml had highest mean value of 22cm followed by weekly watering with 200 ml (20.22cm) followed by daily watering 200 ml (19.03cm) and twice daily watering/200 ml (18.23cm)), while the least mean girth was observed in seedlings subjected to 50 ml daily watering with 4.5 mm, The number of leaves produced ranged from 16 to 20 leaves. Highest mean number of leaves was recorded in daily watering with 150 ml (20)), twice daily watering 150 ml (20) weekly watering with 100 ml (20), fortnightly 150 ml (20) and fortnightly with 200 ml (20). There is a significant different in height and the leave production.Inconclusion, seedlings of R. longiflora performed best when watered forthnightly fortnightly with 100 ml volume of water as highest value of seedling height and 150 ml volume of water of number of leaves produced and there was significant difference in height and leave number of the parameter in watering regime.

Keywords: Watering regime*Rothmannialongiflora*, forest, deforestation and resources

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INTRODUCTION

The success or failure of the growth and development of *Rothmannialongiflora*and other indigenous tree crops lies on the nursery techniques applied in raising the seedling and the amount of water application on the crop plant. Resources of the tropical forest are vast and varied. Trees are the dominant component of tropical forest and they produce timber, which is termed the major forest produce (Akande *et al.*, 1998). The natural forests are under high pressure. Great stress and are fast diminishing, through intensive and extensive deforestation or exploitation of the natural resource. There is a growing concern about the possible disappearance of the genetic resources of many

plant species, which have potential or currently in use. Also, industrialization, urbanization and road building involve total forest removal consequence of which includes flooding and erosion (Akachukwu, 1998).

*Rothmannialongiflora*Salisb. is a shrub belonging to the plant family of Rubiaceae, having trumpet-like flower with fruits that are longitudinal in shape. It has been reported to have antimalarial effects and also used in the treatment of measles and to give tribal marks (Akande, 1998). It is used as chewing stick in the treatment of filariasis, dysentery, and fever and also as an analgesic and emetic. Also used in watershed management, minimize climate and provides aesthetic consequently, this species serves as industrial raw material. Furthermore, the plants are considered to have febrifugal and analgesic properties, and a decoction of the leaves, twigs, bark and roots is applied internally or externally in lotions, washes and baths. In Nigeria the roots are used to treat bowel complaints (Akande 1998). Water is the major constituent of any living organisms which is involved in the important biochemical processesDaba (2017). Water is of great importance to the growth of plants because it controls the rate of transpiration which in turn, has effect on the inflow nutrient solutions FAO (1990). Growth and biomass production are directly proportional to the supply and use of water in plantFarrar (1996).

Water is an important factor in the growth, development and productivity of plant. Water availability is the most important environmental factor known to have strong influence on tree species and distribution in the tropics Goyne, and McIntyre, (2003).This study was therefore conducted to investigate the effect of watering regime on the growth potential of *R. longiflora*

MATERIALS AND METHOD

Study Area

The studywas carried out in the West African Hardwood Improvement Project (WAHIP) nursery in Forestry Research Institute of Nigeria Headquarters Ibadan. The area is between latitude 7^0N and 7.2^0N and longitude 26^0E and 27^0E. The climate is mainly tropical with rainfall patterns ranging between 1000mm and 145000mm, the average temperature is about 30^oC while relative humidity is about 65%. There are two different climatic seasons which are dry (November – March) and the rainy season (April – October).

Seed collection and Experimental design

Matured seed of*Rothmannialongiflora*Salisb was collected from seed store in Forestry Research Institute of Nigeria, Headquarters Ibadan.The seeds of *R.longiflora* broadcasted into a germination box filled with topsoil. Watering was done every day.

Forty seedlings with good vigour and relatively uniform growth were randomly selected from the germination box and transplanted into medium sized poly pot (16 x 7 x 0.005 cm^3) filled with these prepared soils, these were exposed to different water supply of three levels.Four watering regimes (once daily, twice in day, weekly and fortnightly) were applied to the seedlings. The treatments were subjected to varying volumes of water (50ml, 100ml, 150ml, and 200ml). The experimental design used for this study was Completely Randomized Design (CRD). Four levels treatments were constituted and replicated 10 times. Making total number of 40 seedling was used for this experiment

The statistical model for CRD is given below:
$Y_{ij}= \mu + A_{i\,j}+ e_{ij}$
Y_{ij}= Individual Observation
μ = Overall Mean
A_i = Effect of Factor A
e= Experimental Error

The parameter assessed included shoot height, collar diameter and leaf count weekly for the period of 12 weeks. Data generated from growth parameters measurement was subjected to Analysis of Variance (ANOVA) and means separation with Duncan Multilple Range Test (DMRT) at 5% probability level of significance.

RESULT

The result presented in Table 1 below showed effect of watering regime on the growth potential of *R. longiflora*. Variations were observed in the shoot height of the plants under different watering regimes and volumes ofwater R.*longifolia*. The height of the seedlings varied

between 22 .2cm and 12.45cm. Watering donefortnightly with 100ml had highest mean value of 22 followed by weekly watering with 200ml 20.22 followed by daily watering 200 ml 19.03 and twice daily watering of 200ml (18.23) but they were not significantly different from one other. The shortest plant was observed in plants twice daily in water with mean value of 12.45 (Table1). Watering regimes and volumes of water significantly affected the shoot height of the plants. But the interaction between watering regime and volume used did not significant affect the height of the plants.

Girth of *R. longiflora*plants varied with watering regimes and volumes used in this study. fortnightly watering of 200ml had the plants with highest mean value of 5.9mm. This mean value was not significantly different from daily/watering100ml,daily watering/150ml, daily of watering of 200ml, twice daily 50ml and weekly150ml. Least mean girth was observed in seedlings subjected to50 ml daily watering with 4.5 mm. (Table 1). Girth was significantly affected by watering regimes and volumes of water used. Considering the interaction between watering regime and volume used, there was no significant effect on the girth of the plant.

Watering regimes and volumes played significant role on seedling leaf production as variations were observed in the number of leaves produced by the plants. The number of leaves produced ranged from 16 to 20 leaves. Highest mean number of leaves was recorded in daily watering with 50ml (32 leaves) but significantly different from daily watering/150ml (20±4.8),twice daily watering150ml (20) weekly watering of 100ml (20), significantly of 150ml (20) and significantlyof 200ml (20) (Table 1).Watering regime and volume had significant effect on leaf production. But leaf production was not significantly affected by the interaction between watering regimes and volume used.

Table 1 Effects of watering regimes and different volumes of water on growth of*Rothmannialongiflora*seedlings

Watering Regime and Volume	Height (cm)	Girth (mm)	Number of Leaves
Once daily 50 ml	18.0±4.9^{a}	4.5±1.2^{a}	19±6.2^{a}
Once daily 100ml	18.4±3.7^{a}	4.5± 1.3^{a}	16±5.8^{a}
Once daily 150ml	18.2±6.2^{a}	4.8± 1.0^{a}	20±4.8^{a}
Once daily 200ml	19.03±5.4^{a}	5.8± 0.2^{a}	16±3.6^{a}
	17.18±3.0^{a}	6.0± 1.2^{b}	18±6.8^{b}
Twice daily/50ml			
Twice daily/100ml	14.09±2.8^{ab}	5.6± 1.2^{b}	17±5.7^{b}
Twice daily/150ml	12.45±5.8^{b}	5.8±1.2^{b}	20±4.6^{b}
Twice daily/200ml	18.23±6.9^{b}	4.6±1.1^{ab}	18±3.2^{ab}
	16.34±7.3^{ab}	5.8±1.0^{b}	17±2.1^{b}
Weekly 50ml			
Weekly 100ml	17.45±5.9^{b}	5.8±0.3^{b}	20±2.2^{b}
Weekly150ml	18.35±6.2^{b}	5.5±0.2^{ab}	18±1.2^{ab}
Weekly 200ml	20.22±1.2^{b}	4.6± 0.7^{b}	16±0.1^{b}
	19.01 ± 2.8^{ab}	4.9±0.6^{b}	16±2.8^{b}
Fortnightly /50ml			
Fortnightly /100ml	22.32 ±1.0^{b}	5.7±0.4^{b}	18±2.4^{b}
Fortnightly 150ml	13.22 ±2.2^{bc}	5.2±0.3^{bc}	20±2.1^{bc}
Fortnightly 200ml	14.02 ±5.1^{c}	5.9±0.2^{c}	20±1.1^{c}

***Note**: Means with the same letter under each column are not significantly different from each other at probability level 0.05 according to LSD*

Table 2: Analysis of Variance for watering regime on the height of *R. longiflora* seedlings

SV	Df	SS	MS	F	PV
Watering Regime	3	129.508	43.169	21.976	.000
Volume	3	5.779	1.926	.981	.414
Watering Regime * volume	9	21.560	2.396	1.220	.318
Error	32	62.860	1.964		
Total	47	13020.707			

There is significance difference at 5% of probability level

Table 3. Analysis of Variance for watering regime on the collar diameter of *R. longiflora* seedlings

SV	Df	SS	MS	F	PV
Watering Regime	3	0.664	0.221	0.837	0.483
Volume	3	0.580	0.193	0.731	0.541
Watering Regime * volume	9	0.913	0.101	0.384	0.943
Error	32	8.454	0.264		
Total	47	10.611			

There is significance difference at 5% of probability level.

Table 4: Analysis of Variance for watering regime on the leaf production of *R. longiflora* seedlings

SV	Df	SS	MS	F	PV
Watering Regime	3	2.750	0.917	0.419	0.741
Volume	3	4.917	1.639	0.749	0.531
Watering Regime * volume	9	28.250	3.139	1.435	0.215
Error	32	70.00	2.188		
Total	47	105.917			

There is significance difference at 5% of probability level

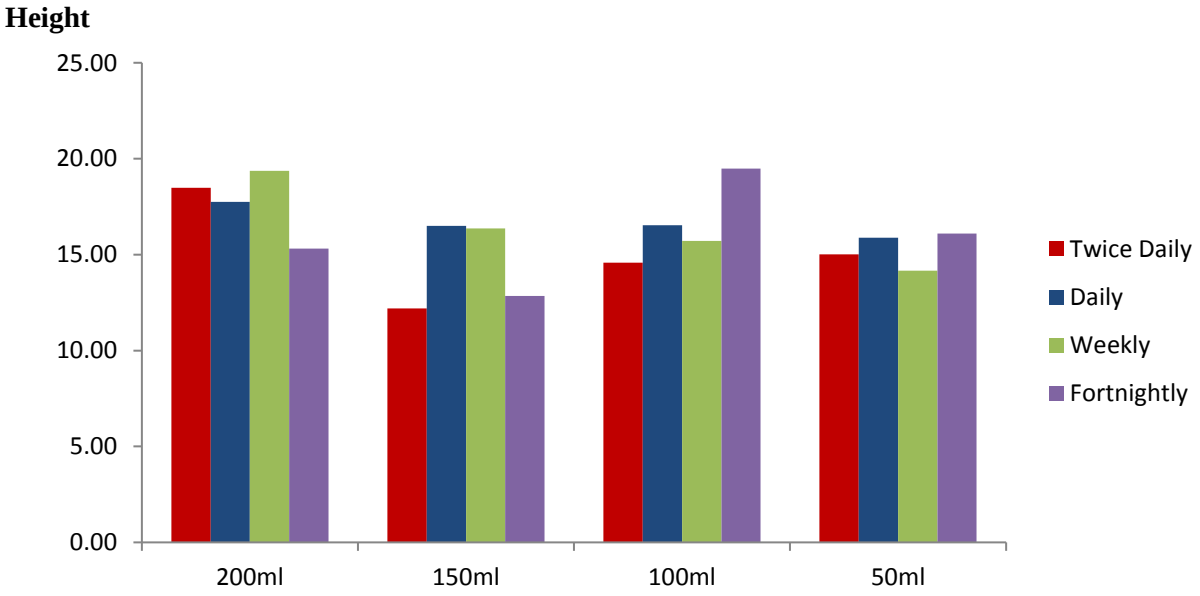

Figure 1: Effects of volumes of water on the height of *R. longiflora* seedlings

Collar diameter

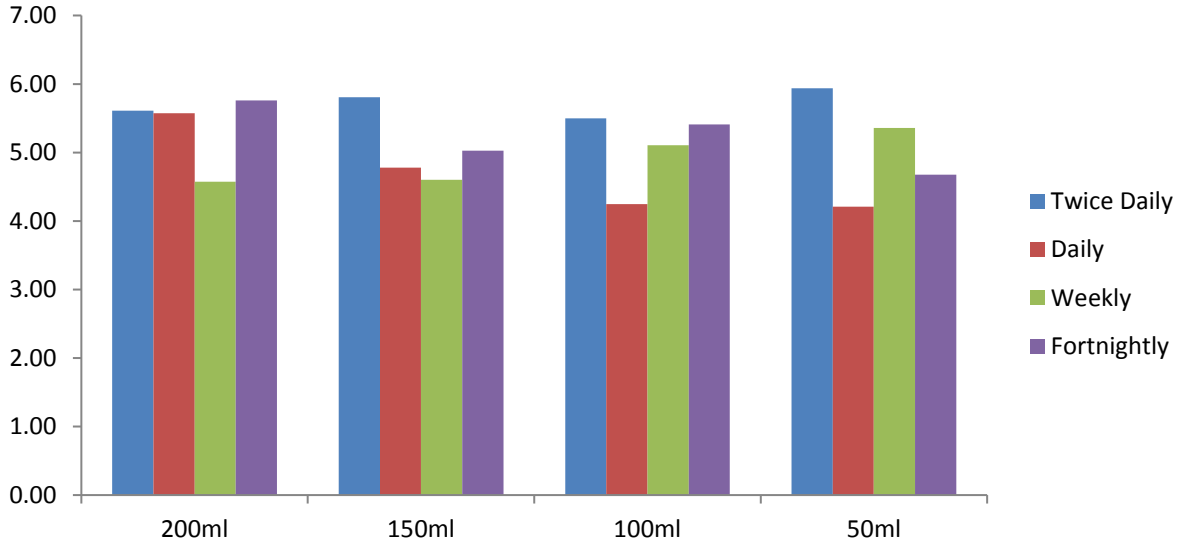

Figure 2: Effects of volumes of water on the collar diameter of *C. petendra*\ seedlings

Number of leaves

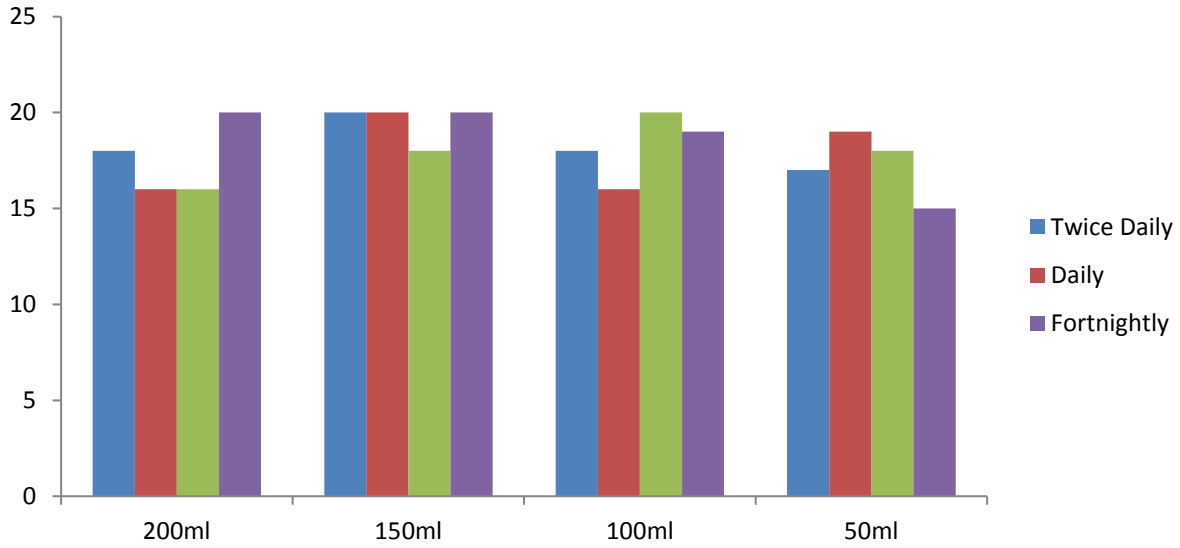

Figure 3: Effects of volumes of water on the number of leaves of *R. longiflora* seedlings

DISCUSSION

Optimum quantity of water is essential for the growth of any species (Nwoboshi, 1982), for each ton of vegetative growth, hundreds of tons of water may be consumed by the growing plant. Similarly, too much of water in excess of plant need may retard physiological processes in plant. While Oboho, and Igharo, (2017) observed that the reduction in relative water contents affects physiological processes in plants. Seedlings of *R.*

longiflora strived significantly with 100ml with mean value of 22volume of water as highest value of seedling height, and number of leaves were produced. It was also evident that the plant can tolerate excessive moisture as plants exposed to fortnightly had good growth. The absence of any considerable difference in the biomass accumulation of all the treatments indicated that the plant has very good water use efficiency and the ability to adjust in the absence of sufficient water. In contrary to this findings, it was observed that seedlings that were watered weekly (slightly stressed) had enhanced height growth and produced more leaves than those watered daily and weekly in *Acacia Senegal* (Ogidan *et al.*, 2018 and Gbadamosi, 2014) reported that root to shoot ratio was 3.5 times higher in water stressed plant.

CONCLUSION

Seedlings of *R. longiflora* performed best with 100ml volume of water as highest value of seedling height and 150ml volume of water of number ofleaves produced and there was significant difference in height and leave number of the parameter in watering regime.

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