E-ISSN: 2788-9297
P-ISSN: 2788-9289
https://www.agrijournal.org
SAJAS 2023; 3(2): 21-31
Received: 10-05-2023
Accepted: 16-06-2023

Umar MR
Department of Forestry and Wildlife Management, Faculty of Agriculture, Modibbo Adama University Yola, Nigeria

Gabriel CA
Department of Forestry and Wildlife Management, Faculty of Agriculture, Modibbo Adama University Yola, Nigeria

Correspondence Author:
Umar MR
Department of Forestry and Wildlife Management, Faculty of Agriculture, Modibbo Adama University Yola, Nigeria

Early growth performance of *Balanites aegyptiaca* and *Eucalyptus camaldulensis* under different light intensity in Modibbo Adama University, Yola Girie local government Area, Adamawa State, Nigeria

Umar MR and Gabriel CA

Abstract
Influence of different light intensities on seed germination and early growth rate of *Balanites aegyptiaca* and *Eucalyptus camaldulensis* seedlings. Light intensity is also affected by dust particles and atmosphere water vapor, slope of the land, and elevation. The seeds of *Balanites aegyptiaca* and *Eucalyptus camaldulensis* species were obtained from the local market in Girei Local Government Area of Adamawa State. Data was collected for three (3) months under different light intensity ten (10) species each was used for both Balanite and Eucalyptus. Descriptive statistics was used to estimate the mean of the measure. Complete randomized design (CRD) was use to check for the variation in the light intensity. Two way ANOVA was use in the comparism between parameters (Height, Girth and Leaves). The result revealed that highest frequency was obtained in first in leaves with value 38.695 and 9.989 of Girth in first month. Highest frequency was obtained in leaves with 51.212 and lowest in Girth 10.120 in second month while 45.108 frequency was obtained in eleven week and lowest in Girth 5.463 in nine week third month. Which is highly significant between the observed values in three months ($p<0.05$). Pearson correction was used in the analysis between species and was observed that there is positive correction between height and girth with values of – 0.784 and inversely correlated with – 0.409. Furthermore, height and leaves also has negative correlation of – 0.363 at significant difference under 1-tailed as shown in all the variables ($p<0.05$). The result shows significant difference for both Balanite under light and shade as well as Eucalyptus under light and shade. It was observed that eucalyptus grows very good and fast under light than Balanite under different light intensity. The influence of light intensity on germination and growth patterns has important implications for establishment and spread of tree plants in response to forest disturbance effect should be intensified on long term due to the accumulation of eucalyptus. Seed germination and early growth of forest seedlings is affected by some factors such as light intensity, air, temperature, water, soil condition.

Keywords: Light intensities, tree species and parameters (Height, Girth and Leaves)

Introduction
Light or darkness can be an environmental trigger for germination and is a type of physiological dormancy. Most seeds are not affected by light or darkness, but many seeds, including species found in forest settings, will not germinate until an opening in the canopy allows sufficient light for growth of the seedling (Lui *et al.,* 2019) [13]. The intensity of light can change with the time of the day, season, geographic location, and distance from the equator, and weather. It gradually increases from sunrise to the middle of the day and then gradually decreases toward sunset; it is high during summer, moderate in spring and fall, and low during winter time. Maximum intensity occurs at the equator, and gradually decreases with increasing distance from the equator to the south and north poles (Cheng *et al.,* 2019) [4]. Light intensity is also affected by dust particles and atmospheric water vapor, slope of the land, and elevation (Edmond *et al.,* 1978) [8]. Depending on the particular time of the year, the sun-to-earth distance varies; it is closest in January (about 147 million km) and farthest in early July (about 151 million km; Davis, 1977) [66]. This causes a slight variation in the amount of light and heat that the earth receives. Likewise, many factors can affect indoor light.
Further, leaves on a single plant differ in the amount of light that they receive. The amount of light incident on a leaf decreases as sunlight passes downward through the canopy. Leaves on the upper part of the canopy tend to shade and reflect light away from the lower leaves. Plants with somewhat vertical leaves (Erectophyle plant type) allow more downward passage

of light and tolerate high population planting than plants with drooping leaves (planophyle type) (Chapman and Carter, 1976) [5]. Row planting and proper spacing can also minimize interplant shading.

Light is an absolute requirement for plant growth and development. However, different plants have optimum requirements and both deficient and excessive light intensities are injurious. Subject to physiological limits, an increase in the intensity of light will result to an increase in the rate of photosynthesis and will likewise reduce the number of hours that the plant must receive every day (Manaker, 1981) [14]. During summer when light supply is abundant and almost continuous in Alaska, potatoes and cabbages of enormous sizes have been produced (Janick, 1972) [11]. According to Chapman and Carter (1976) [5], the minimum limit for the process of photosynthesis in most plants is between 100 and 200 fc. But light intensity of as low as 10 lux (0.93 fc), which occurs at twilight, can affect phototropic response (Vergara, 1978) [20].

Deficient light intensities tend to reduce plant growth, development and yield. This is because low amount of solar energy restricts the rate of photosynthesis. Below a minimum intensity, the plant falls below the compensation point. Photosynthesis significantly slows down or ceases while respiration continues. Compensation point is the metabolic point at which the rates of photosynthesis and respiration are equal so that leaves do not gain or lose dry matter (Sahin, 2020) [18].

Etiolation, a morphological manifestation of the adverse effect of inadequate light, is described by (Chapman and Carter, 1976) [5] in the following manner: it develops white, spindly stems, elongated internodes, leaves that are not fully expanded, and a stunted root system. Likewise, excessive light intensity should be avoided. It can scorch the leaves and reduce crop yields. Edmond *et al*. (1978) [8] provided three explanations: Chlorophyll content is reduced. This reduces the rate of light absorption and the rate of photosynthesis; Excess light intensity is associated with increase in the temperature of leaves which in turn induces rapid transpiration and water loss. The guard cells lose turgor, the stomata's partially or completely close, and the rate of diffusion of carbon dioxide into the leaves lows down. The rate of photosynthesis decreases while respiration continues; resulting to low availability of carbohydrates for growth and development; and High leaf temperature inactivates the enzyme system that changes sugars to starch. Sugars accumulate and the rate of photosynthesis slows down. In tropical cultivation, soil erosion is a major problem.

Therefore, the soil treatment has to be as shallow as possible. Plowing is required only for high planting densities. In low planting densities, "it is better to dig pits and refill them with the soil. This ensures good root system penetration without causing too much land erosion. The pits must be 30 to 50 cm deep, and 20 to 40 cm wide." *Balanites aegyptiaca* and *Eucalyptus camaldulensis* can be propagated from seed or cuttings. Direct seeding is possible because the germination rate of *Balanites aegyptiaca* and *Eucalyptus camaldulensis* is high. While seed germination and plant growth are regulated internally, they are greatly influenced by external conditions such as the intensity and duration of light and temperature (Dennis, 2009) [7]. Aside from its effect through photosynthesis, light influences the growth of individual organs or of the entire plant in less direct ways. The most striking effect can be seen between a plant grown in normal light and the same kind of plant grown in partial darkness or total darkness. The plant grown in the partial dark or total dark will have a tall and spindling stem. The leaves fail to expand, and both leaves and stem, lacking chlorophyll, are pale yellow. Such a plant is said to be etiolated (Dennis, 2009) [7]. Both the intensity and duration (length) of light may have different and characteristic effects upon plant growth and development. It has been found that the length of the daylight period may have a striking effect upon vegetative growth and reproductive activities of plants. The reaction of plants in relation to the length of the day is called Photoperiodic (Dennis, 2009) [7].

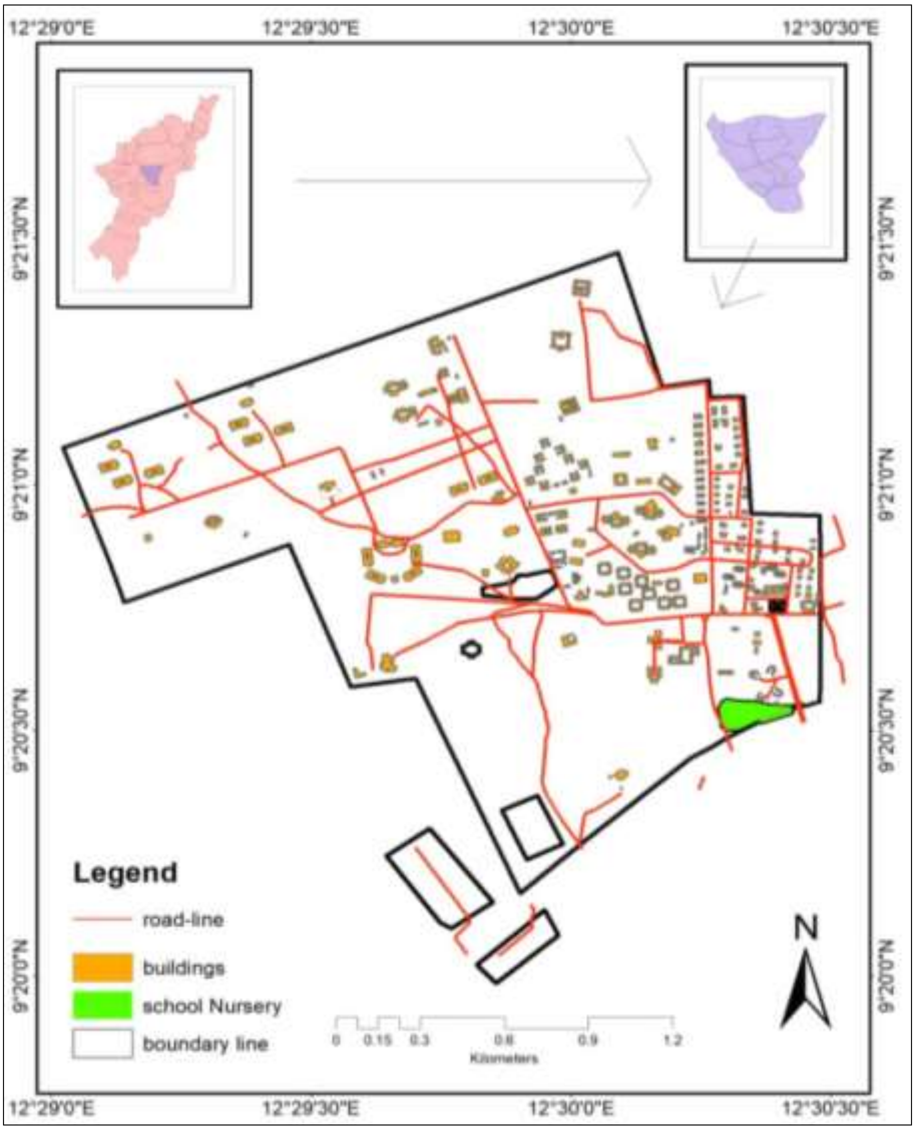
This study will be carried out to investigate how *Balanites aegyptiaca* and *Eucalyptus camaldulensis* seedlings respond to various light intensities and to also monitor the early growth characteristics and habits of the seedlings of the species under different light intensities using wire gauze to distinguish between various intensities, which are compared with the performance of seeds and seedlings of the species sown and planted in the nursery without any wire gauze.

Materials and Methods

Location of the study site

The study was conducted in the nursery of the Department of Forestry and Wildlife Management, Modibbo Adama University, Yola Adamawa State, located between Latitude; 8 ^{0}N and 11 ^{0}N and Longitude; 11.5^o E and 13.5 ^{o}E. Adamawa State falls under the Sudan, Southern and Guinea Savannah types of vegetation and it experiences distinct dry and wet seasons with temperature and humidity varying with seasons. The wet or rainy season lasts from April to November, and is characterized by single maxima in August and September. During this season, the moisture laden south west trade wind from the Atlantic Ocean blows over the area. Seventy percent of the total rainfall in the area happens to fall within four months of May-September (Adebayo, 1999) [1].

The area has an average of 62 rainy days, while average amount of rainfall recorded in the area in 972 mm. The dry season which is the harmattan period is between Decembers to March. The period is characterized by dry, dusty and hazy Northern trade wind that blows over the area from Sahara Desert. Temperature within the area varies with season. Although the temperatures are relatively high almost all the year round, temperature of the area ranges from 27 °C to 40 °C (Adebayo and Tukur, 1999) [1]. The natural vegetation of the area is Sudan Savannah type which is characterized by thick vegetation around hills and mountain ranges. The vegetation has a wide variety of Savannah tree species among which are; *Parkia biglobosa, Acacia spp, Adansonia digitata, Anogeissus leiocarpa* (Adebayo, 1999) [1].



Source: Google GIS Digitizing

Map of Modibbo Adama University Showing Study Site.

Materials for the Experiment
The following materials used to achieve the aim of the project. These include: Top soil, Poly pots size (25cm x l3cm x 6cm), Watering can, Sieve, Measuring ruler, Pen, Exercise book, Seeds of *Balanites aegyptiaca* and *Eucalyptus camudulences,* Wire gauze, Wheelbarrow and Shovel and Hand trowel

Source and Sowing Methods
The seeds of *Balanites aegyptiaca* and *Eucalyptus camaldulensis* species were obtained from the local market in Girei Local Government Area of Adamawa State. Ten species seed each was subjected to peregrination test by soaking in cold water for three days, to enable the seed get its moisture and break dormancy, after which it was planted in polybags i.e. ten polybags each for *Balanites aegyptiaca* and *Eucalyptus camaldulensis* for proper observation in their growth and in both the two location under light and at room temperature. Parameter to be measure was Height, Girth, and Number of branches and leaves of each species on weekly bases. The observation was last for the period of two (2) months.

Parameter to Assess: Height (cm): This was carried out using a graduated ruler.
Leave count: This was carried out by counting the. Number of leaves per plant.
Girth (mm): This was carried out by the use of Vernier caliper.
Branches: was carried out by counting the number of branches on the species

Nursery work and assessment of plant parameters.
The experimental seedlings were watered twice a day, in the morning and evening with the aid of a watering can. A graduated rule was used to measure the height of seedlings at time intervals and was recorded accordingly.

Data analysis
Descriptive statistics was used to estimate the mean of the measured variables. Complete Randomized Design (CRD) was use & to check for the variation in the light intensity and at room temperature. While, Least Significant Difference (LSD) was also used for mean separation. Correlation was used. For the variation and compute their association.

Formular (CRD)
Model: Yij=μ+Ti+Ɛ
ij

Where
Yij = Individual observation
μ = General mean
Ti = Effect of Light intensity
Ɛ= Experimental error
ij

FORMULAR (LSD)

$$LSD_{A,B} = t_{0.05/2DFW}\sqrt{MSW\,(1/n_A+1/n_B)}$$

Where
MS_W = mean square within, obtained from the result of ANOVA test
N = number of scores used to calculate the means.

Results

Data Collection Result and Discussion

Result from table 1 shows the measurement obtained for Balanite and Eucalyptus under different light intensity on monthly bases for the period of three months. From the first month Eucalyptus has Highest, Girt and Leaves with values of 41cm, 22cm and 48 respectively. While Balanite has Height, Girth and Laves with values of 28cm, 36cm and 42 respectively this is recorded in the four week

Second month results was taken at the fourth week and it was presented as follows, Balanite has highest, Girth and leaves as 37cm, 44cm and 52 respectively while Eucalyptus has highest, Girth and leaves as 46cm, 26cm and 31 respectively both under different light intensity.

Third month results reveals that highest, Girth and leaves was observed in Balanite with 43cm, 24cm and 60 respectively, while Eucalyptus height Girth and leaves results shows 53cm, 23cm and 39 respectively both under different light intensity and reading was taken in the fourth week.

Table 1: Data Collection Result First Month

S/N	Height	Girith	Leaves	Branches
Eucalyptus under light				
41	25.7cm	12	19	-
42	28.9cm	14	22	-
43	32.7cm	15	23	-
44	41.8cm	18	18	-
45	29.5cm	14	23	-
46	31.9cm	15	21	-
47	28.8cm	13	19	-
48	31.10cm	15	21	-
49	34.6cm	16	22	-
50	31.11cm	15	21	-
Eucalyptus under shade				
51	26.10cm	10	20	-
52	22.5cm	10	15	-
53	28.9cm	12	29	-
54	22.8cm	22	24	-
55	24.4cm	9	23	-
56	25.3cm	9	18	-
57	27.8	11	23	-
58	31.8cm	14	19	-
59	31.8	14	21	-
60	28.7	12	20	-
Balanite under Light				
61	23.5cm	9	36	-
62	21.3cm	11	35	-
63	21.6	9	39	-
64	28.8cm	9	48	-
65	18.8cm	8	46	-
66	21.5cm	9	28	-
67	21.9cm	9	29	-
68	21.3cm	9	33	-
69	28.4cm	10	40	-
70	28.3cm	10	46	-
Balanite under shade				
71	21.4cm	12	37	-
72	18.10cm	10	30	-
73	19.5cm	11	32	-
74	22.9cm	12	32	-
75	19.2cm	11	30	-
76	22.6cm	12	41	-
77	22.9cm	12	27	-
78	24.6cm	14	42	-
79	18.8cm	10	36	-
80	19.4cm	11	32	-

Table 2: Data Collection Second Months

S/N	Height	Girith	Leaves	Branches
Balanite under light				
41	28.8cm	13	44	-
42	25.5cm	14	33	-
43	26.9cm	13	46	-
44	31.11cm	13	46	-
45	23.12cm	12	52	-
46	25.12cm	13	35	-
47	25.12cm	13	37	-
48	26.6cm	13	40	-
49	32.5cm	14	48	-
50	33.7cm	44	46	-
Balanite under shade				
51	25.7cm	16	41	-
52	23.14cm	14	37	-
53	24.9cm	15	40	-
54	27.12cm	16	40	-
55	24.4cm	15	38	-
56	28.10cm	16	47	-
57	37.12cm	16	34	-
58	30.11cm	18	48	-
59	23.10cm	14	43	-
60	24.6cm	15	40	-
Eucalyptus under light				
61	31.11cm	16	26	-
62	33.11	18	30	-
63	37.11cm	19	31	-
64	46.12cm	12	25	-
65	35.12cm	18	30	-
66	38.13cm	19	29	-
67	33.11cm	17	27	-
68	36.12cm	19	29	-
69	40.10cm	20	30	-
70	37.14	19	29	-
Eucalyptus under shade				
71	31.11cm	14	28	-
72	26.8cm	14	23	-
73	34.13cm	16	26	-
74	27.11cm	26	32	
75	29.8cm	13	30	-
76	29.5cm	13	25	-
77	30.11cm	15	30	-
78	35.12cm	18	27	-
79	35.12cm	18	27	-
80	31.9cm	16	27	-

Table 3: Data Collection Third months

S/N	Height	Girth	Leaves	Branches
Balanite under light				
41	37.13cm	23	52	-
42	23.9cm	21	41	-
43	35,13cm	20	54	-
44	37.13cm	24	54	-
45	21.16cm	19	60	-
46	43.16cm	21	43	-
47	35.9cm	21	45	-
48	34.9cm	21	48	-
49	40.11cm	23	56	-
50	41.12cm	24	54	-
Balanite under shade				
51	23.9cm	20	48	-
52	28.17	18	34	-
53	29.12cm	19	47	-
54	31.14cm	20	47	-
55	28.8cm	19	35	-
56	32.11cm	20	54	-

57	31.16cm	20	41	-
58	34.12cm	22	55	-
59	27.12cm	18	50	-
60	29.10cm	19	47	-
Eucalyptus under light				
61	38.15cm	23	34	-
62	40.15cm	25	38	-
63	43.16cm	26	39	-
64	53.17cm	29	23	-
65	42.15cm	25	38	-
66	35.17cm	26	37	-
67	40.14cm	22	25	-
68	42.16cm	26	37	-
69	47.16cm	27	39	-
70	44.18	26	37	-
Eucalyptus under shade				
71	35.14cm	18	33	-
72	30.10cm	18	28	-
73	38.15cm	30	31	-
74	31.13cm	30	37	-
75	33.9cm	17	34	-
76	33.9cm	17	30	-
77	34.15cm	18	35	-
78	39.16cm	22	32	-
79	39.16cm	22	32	-
80	35.13cm	20	32	-

***Source*: Field work 2022**

Anova analysis

The influence of different light intensities on seed germination and early growth rate of *Balanites aegyptiaca* and *Eucalyptus camaldulensis* seedlings. Despite having a broad biological range, *Balanites aegyptiaca* grows to its full potential as a single tree only in low-lying, level alluvial locations with thick sandy, loamy sand and unhindered access to water, such as valley bottoms, river banks, or foot of rocky slopes. After the seedling stage, there is an in tolerance to shade, leading to open woodland or savanna for natural renewal.

Table 2: First week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	675.681	3	225.227	22.803	.000
	Within Groups	355.577	36	9.877		
	Total	1031.258	39			
Girth	Between Groups	131.475	3	43.825	22.379	.000
	Within Groups	70.500	36	1.958		
	Total	201.975	39			
Leaves	Between Groups	2595.475	3	865.158	38.695	.000
	Within Groups	804.900	36	22.358		
	Total	3400.375	39			

***Source*:** SPSS output

Height, girth and leaves frequency was found to have a significant ($P < 0.05$) effect on seedlings $F(3,39)=22.803$, $F(3,39)=22.379$ and $F(3,39)=38.695$ respectively was highly significant recorded in seedlings watered once daily, and this was significantly different with seedlings watered once after 14 days as shown in Table 1, since their p-value is less than 0.05.

Table 3: Second week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	643.870	3	214.623	17.835	.000
	Within Groups	433.210	36	12.034		
	Total	1077.080	39			
Girth	Between Groups	113.075	3	37.692	15.614	.000
	Within Groups	86.900	36	2.414		
	Total	199.975	39			
Leaves	Between Groups	2740.200	3	913.400	39.723	.000
	Within Groups	827.800	36	22.994		
	Total	3568.000	39			

***Source*:** SPSS output

A significant effect was observed in watering frequencies on seedlings leaf, girth and height production (Table 4.2) in the second week ($p < 0.05$) higher number of leaves and the least number of leaves was recorded from seedlings that received water once after 14 days

Table 4: Third week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	721.941	3	240.647	18.918	.000
	Within Groups	457.938	36	12.721		
	Total	1179.879	39			
Girth	Between Groups	149.000	3	49.667	9.989	.000
	Within Groups	179.000	36	4.972		
	Total	328.000	39			
Leaves	Between Groups	2330.200	3	776.733	33.779	.000
	Within Groups	827.800	36	22.994		
	Total	3158.000	39			

***Source*:** SPSS output

The results of the ANOVA for the third week indicate significant difference for all variable (P < 0.05).

Table 5: Forth week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	639.449	3	213.150	17.763	.000**
	Within Groups	431.986	36	12.000		
	Total	1071.435	39			
Girth	Between Groups	154.675	3	51.558	10.410	.000**
	Within Groups	178.300	36	4.953		
	Total	332.975	39			
Leaves	Between Groups	2304.600	3	768.200	33.344	.000**
	Within Groups	829.400	36	23.039		
	Total	3134.000	39			

***Source*:** SPSS output

** indicate significant difference at 1% level.

The ANOVA table above showed significant difference for both Balanite under light and Balanite under shade as well as Eucalyptus under light and Eucalyptus under shade since their P-value is less than the critical P-value of 0.05 (P < 0.05).

Table 6: Fifth week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	626.033	3	208.678	17.533	.000
	Within Groups	428.479	36	11.902		
	Total	1054.513	39			
Girth	Between Groups	149.100	3	49.700	10.120	.000
	Within Groups	176.800	36	4.911		
	Total	325.900	39			
Leaves	Between Groups	2148.275	3	716.092	45.108	.000
	Within Groups	571.500	36	15.875		
	Total	2719.775	39			

***Source*:** SPSS output

The result of the ANOVA for the third week indicate significant difference for all variable (P < 0.05)

Table 7: Sixth week ANOVA result

		Sum of Squares	df	Mean Square	F	Sig.
Height	Between Groups	624.012	3	208.004	17.957	.000
	Within Groups	416.996	36	11.583		
	Total	1041.008	39			
Girth	Between Groups	154.475	3	51.492	10.635	.000
	Within Groups	174.300	36	4.842		
	Total	328.775	39			
Leaves	Between Groups	2223.875	3	741.292	51.212	.000
	Within Groups	521.100	36	14.475		
	Total	2744.975	39			

***Source*:** SPSS output

The result of the ANOVA for the third week indicates significant difference for all variable (P < 0.05).

Table 8: Seventh week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	629.947	3	209.982	18.127	.000
	Within Groups	417.018	36	11.584		
	Total	1046.965	39			
Girth	Between Groups	154.475	3	51.492	10.635	.000
	Within Groups	174.300	36	4.842		
	Total	328.775	39			
Leaves	Between Groups	1945.800	3	648.600	35.779	.000
	Within Groups	652.600	36	18.128		
	Total	2598.400	39			

Source: SPSS output

The result of the ANOVA for the third week indicate significant difference for all variable (P < 0.05).

Table 9: Eighth week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	676.868	3	225.623	17.454	.000
	Within Groups	465.354	36	12.926		
	Total	1142.222	39			
Girth	Between Groups	157.400	3	52.467	10.818	.000
	Within Groups	174.600	36	4.850		
	Total	332.000	39			
Leaves	Between Groups	1901.000	3	633.667	37.731	.000
	Within Groups	604.600	36	16.794		
	Total	2505.600	39			

Source: SPSS output

The result of the ANOVA for the third week indicate significant difference for all variable (P < 0.05)

Table 10: Ninth week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	587.412	3	195.804	17.841	.000
	Within Groups	395.109	36	10.975		
	Total	982.521	39			
Girth	Between Groups	89.600	3	29.867	5.463	.003
	Within Groups	196.800	36	5.467		
	Total	286.400	39			
Leaves	Between Groups	1770.200	3	590.067	29.284	.000
	Within Groups	725.400	36	20.150		
	Total	2495.600	39			

Source: SPSS output

The result of the ANOVA for the third week indicate significant difference for all variable (P < 0.05)

Table 11: Tenth week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	521.941	3	240.647	18.918	.000
	Within Groups	357.938	36	12.721		
	Total	1079.879	39			
Girth	Between Groups	138.000	3	49.667	9.989	.000
	Within Groups	168.000	36	4.972		
	Total	228.000	39			
Leaves	Between Groups	140.200	3	776.733	33.779	.000
	Within Groups	727.800	36	22.994		
	Total	2158.000	39			

Source: SPSS output

The result of the ANOVA for the third week indicates significant difference for all variable (P < 0.05.

Table 12: Eleventh week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	626.033	3	208.678	17.533	.000
	Within Groups	428.479	36	11.902		
	Total	1054.513	39			
Girth	Between Groups	149.100	3	49.700	10.120	.000
	Within Groups	176.800	36	4.911		
	Total	325.900	39			
Leaves	Between Groups	2148.275	3	716.092	45.108	.000
	Within Groups	571.500	36	15.875		
	Total	2719.775	39			

Source: SPSS output

The result of the ANOVA for the third week indicate significant difference for all variable ($p< 0.05$)

Table 13: Twelve week ANOVA result

		Sum of Squares	Df	Mean Square	F	Sig.
Height	Between Groups	629.947	3	209.982	18.127	.000
	Within Groups	417.018	36	11.584		
	Total	1046.965	39			
Girth	Between Groups	154.475	3	51.492	10.635	.000
	Within Groups	174.300	36	4.842		
	Total	328.775	39			
Leaves	Between Groups	1945.800	3	648.600	35.779	.000
	Within Groups	652.600	36	18.128		
	Total	2598.400	39			

Source: SPSS output

The result of the ANOVA for the third week indicate significant difference for all variable ($p< 0.05$).

Table 14: LSD post-hoc multiple comparison

Weeks	Height	Girth	Leaves
First week	20.9175±.81306*	8.2750±35982	22.8750±1.47639*
Second week	23.5500±.83092**	9.7250±.35804*	25.0000±1.51234
Third week	24.7050±.86967**	11.0000±.45854*	26.5000±1.42280*
Forth week	25.7750±.82874*	11.9750±.46200	28.5000±1.41738***
Fifth week	26.7233±.82217*	12.9500±.45707**	29.8250±1.32040*
Sixth week	27.5905±.81689	13.9250±.45908*	31.9750±1.32650**
Seventh week	28.8545±.81923	14.9250±.45908**	33.2000±1.29060
Eighth week	30.2283±.85568**	16.0000±.46132*	34.9000±1.26734*
Ninth week	31.6220±.79361*	17.3000±.42847*	36.6000±1.26481**
Tenth week	28.6610±.57820	12.4000±.3047	29.7803±1.4917*
Eleventh week	29.8836±.7762*	11.7903±.4473**	26.9251±1.0723
Twelve week	30.3338±.6628**	13.8104±.1937	28.7730±1.5148**

Table 15: Correlation Analysis

		Treatment	Height	Girth	Leaves
Pearson Correlation	Treatment	1.000	.520	.174	-.690
	Height	.520	1.000	.784	-.409
	Girth	.174	.784	1.000	-.363
	Leaves	-.690	-.409	-.363	1.000
Sig. (1-tailed)	Treatment	.	.000	.141	.000
	Height	.000	.	.000	.004
	Girth	.141	.000	.	.011
	Leaves	.000	.004	.011	.
N	Treatment	40	40	40	40
	Height	40	40	40	40
	Girth	40	40	40	40
	Leaves	40	40	40	40

Source: SPSS output

*. The mean difference is significant at the 10% level, **. The mean difference is significant at the 5% level, ***. The mean difference is significant at the 1% level. This study compares the influence of different light intensities on seed germination and early growth rate of *Balanites aegyptiaca* and *Eucalyptus camaldulensis* seedlings for the period of nine weeks. It can be noted that the multiple comparison shows that for the first week, leaves has the highest mean

and standard error of 22.8750±1.47639, while girth has the least value of 8.2750±.35982. for the second week leaves has the highest value of 25.0000±1.51234 while girth has the least value of 9.7250±.35804, this process goes on to the ninth week which shows that leaves has the highest value of 36.6000±1.26481, while girth has the least value of 17.3000±.42847, the result shows significant difference for both Balanite under light and Balanite under shade as well as Eucalyptus under light and Eucalyptus under shade.

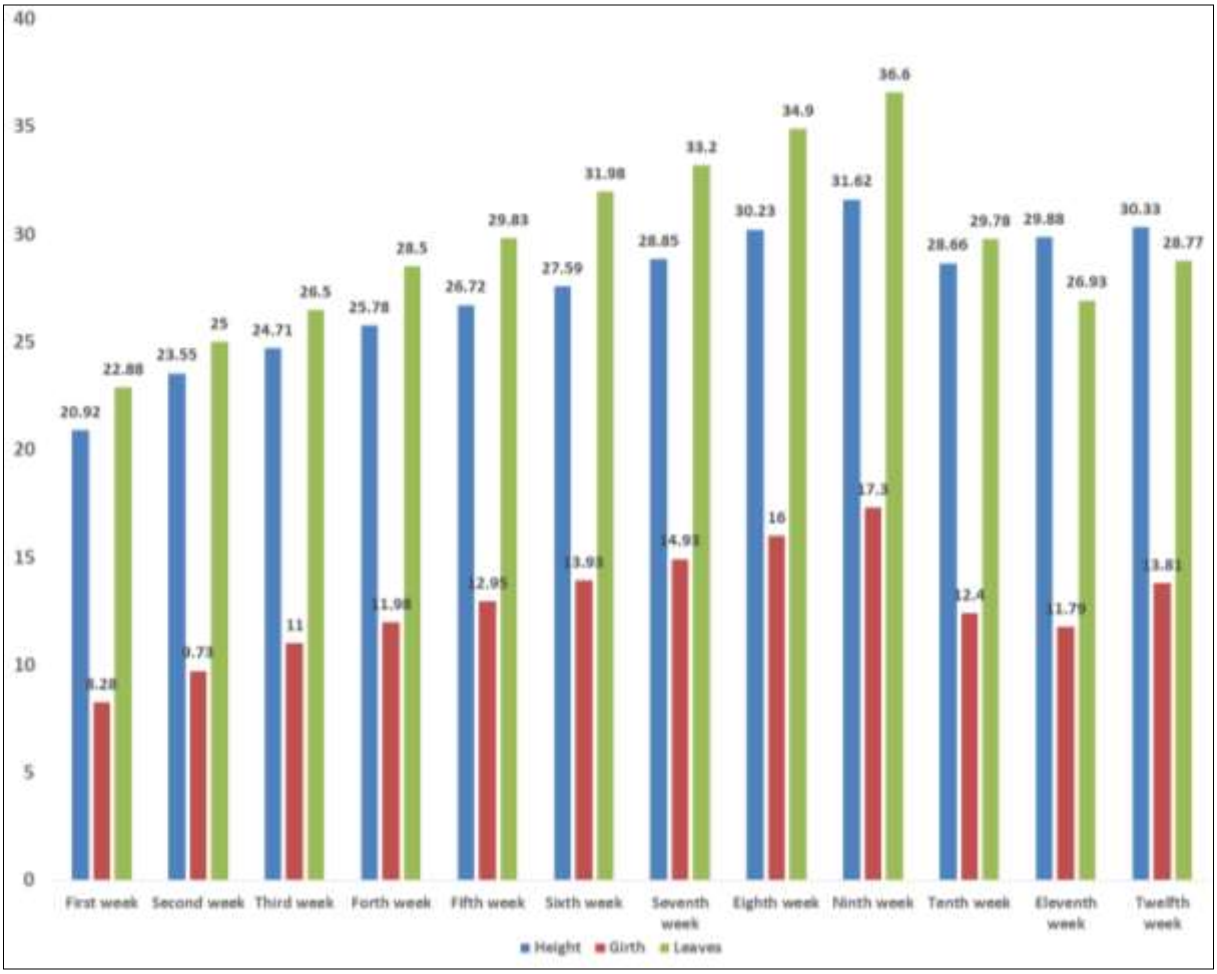


Fig 1: Different light intensities on seed germination

The table above showed the pearson correlation of the germination potential of *Balanites aegyptiaca and Eucalyptus camaldulensis* seeds under different light intensities. It can be noted that, there is a strong positive correlation between height and girth (0.784), an inverse correlation of -0.409 between height and leaves also a negative correlation of -0.363 is shown between leaves and girth a statistically significant difference of 1-tailed is shown for all the variables ($P < 0.05$).

Discussion

Most seeds are not affected by light or darkness, but many seeds, including species found in forest settings, will not germinate until an opening in the canopy allows sufficient light for growth of the seedling (Lui *et al.*, 2019) [13]. The intensity of light can change with the time of the day, season, geographic location, and distance from the equator, and weather. It gradually increases from sunrise to the middle of the day and then gradually decreases toward sunset; it is high. The chemical quality of this organic matter strongly influences plant growth. Our experiment shows that at high dose, eucalyptus litter reduced plant flowers (and early flowering), growth and production, probably through its acidity and very high level of phenol compounds (as evidence by negative correlation between variables growth and these two parameters). Soil acidity decrease roots growth and soil explored by roots and therefore a decrease of mineral absorption for plant growth. Many authors (Koyama *et al*., 2001; Hopkinsa *et al*., 2004; Pavlovkin *et al*., 2009) [12, 9, 16] have shown that plants exposed to low pH stress are normally subjected to metal toxicity, and hence decrease in the root growth and the total biomass.

Acidity significantly reduces mineral absorption by plants (James and Nelson, 1981) [10]. The evidence of this is as shown from the result Balanite under shade, Balanites under light, Eucalyptus under light and Eucalyptus under shade respectively. Lowest chlorophyll content in leaves and flowering retardation of plants for the treatment Balanite under shade compared to other treatments is probably a consequence of this nutritional imbalance. This inhibition can severely compromise groundnut yield (Catan and Fleury, 1998) [3] especially in Sahelian countries where rainy season would only last for three months. At high litter amendment (5%), eucalyptus reduced drastically *Balanites aegyptiaca* and *Eucalyptus camaldulensis* seedlings, suggesting that accumulating of eucalyptus residues in time could reduce plant growth and crops production in intercropping systems. this study corroborates with Suresh and Rai (1987) [19] studies which showed a strong reduction of seeds germination, root length and dry matter production of sorghum, cowpea (*Vigna unguiculata*) and sunflower in cultivating with *Eucalyptus tereticornis, Casuarina equisetifolia* and *Leucaena leucocephala.* Using extract from leaves and bark of *E. tereticornis*, Puri and Khara (1991) [17] observed similar results on *Phaseous vulgaris* germination and total biomass. Seedlings growth was significantly improved by watering frequency where watering once daily and once after three days yielded higher growth than watering once after 7 and 14 days. Seedlings that received water once after seven days and those watered once after fourteen days had lower growth rate but the species was able to withstand the water stress. The lower growth obtained confirmed Mukhtar (2012) [21] that plant water status has a strong influence on plant growth and biomass production through its effect on leaf and root expansion. This implies that growth and biomass production is directly proportional to the supply and use of water.

Reference

1. Adebayo AA, Nwagboso NK. Climate and Agricultural Planning in Adamawa State, In Adebayo, A. A and Tukur A. L (1999) (Eds). Adamawa State in Maps Paracelete Publishers, Nigeria; c1999. p. 10-21.
2. Adebayo AA. Adamawa State in map (Editor).Dept, Geography, F. U. T. Yola 1st Ed Paraclete publisher Yola, Nigeria. 1999;33:112.
3. Catan P, Fury A. Flower production and growth of groundnut plant. Eur. J Agron. 1998;8:13-27.
4. Cheng Y, Liu H, Tong X, Liu Z, Zhang X, Jiang X, *et al*. Effect of light-regulation on the growth, physiological and biochemical properties of Aralia elata (miq) seedlings. 2019;21:456-462. Htts://doi.org/10.1016/j.sajb.12.008
5. Chapman SR, Carter LP. Crop Production: Principles and Practices. San Francisco: W.H. Freeman and Company; c1976. p. 146-163.
6. Davis TN. Sun-Earth distance. Alaska Science Forum (Feb. 16, 1977); c1977. Retrieved April 17, 2Ollfrom http://www2.gi.alaska.edu/ScienceForurn/AF1/142.htm l.
7. Holley D. Light and Temperature Influence Plant Growth: The Role of Light Intensity and Temperature in Plant Development; c2009. http://www.suite 101.com/content/light-and- temperature influence plant growth-al 31 226#ixzzl Qo79hUEm
8. Edmond JB, Senn TL, Andrews FS, Halfacre RG. Fundamentals of Horticulture. 4th ed. McGraw-Hill, Inc; c1978. p. 109-130.
9. Hopkinsa AA, Malinowski DP, Zhang DH, Walker DW. Russian wild rye seedlings are sensitive to acidic soil. Crop Sci. 2004;44:2187-2192.
10. James R, Harper Nelson EB. Characterization of the inhibition of K^+ Absorption in Oat Roots by Salicylic Acid. Plant Physiol. 1981;68:1349-1353.
11. Janick J. Horticultural Science. An introduction to the Scientific and Technological Aspect of Modern Horticulture. Ronald Press, New York; c1972. p. 524.
12. Koyama H, Toda T, Hara T. Brief exposure to low-Ph stress cause irreversible damage to the growing root in Arabidopsis thaliana: pectin-Ca interaction may play an important role in proton rhizotoxicity. J. Exp. Bot. 2001;52:36-368.
13. Lui Ya, Xiuxia Ren, Jeong BR. Supplementary Light source affects Growth, Metabalism, and Physiology of *Adenophora triphylla* (thunb). A.D.C seedlings; c2019. https://doi.org/101155/6283989.
14. Manaker GH. Interior Plants capes: Installation, Maintenance, and Management. Englewood Cliffs, NJ: Prentice-Hall, Inc; c1981. p. 283.
15. National Research Council. *Balanites aegyptiaca* Desert Date. Lost crops of Africa volume 111 fruits; c2008.
16. Pavlvokin J, Palove-Balang P, Kolarovic L, Zelinova V. Growth and functional responses of different cultivars of *Lotus corniculatus* to aluminium and low Ph stress. J plant physiol. 2009;166:1479-1487.
17. Puri S, Khara A. Allelopathic effects of *Eucalyptus tereticornis* on Phaseolus vulgaris seedlings. Int. Tree crops J. 1991;5:143-15 1.
18. Sahin M. Impact of weather on COVID-19 pendamic in Turkey. Science of the Environment, 728, Article ID: 138810. 2020, 12. https://doi.org/10.1016/j.scitotenv.2020.
19. Suresh KK, Rai VRS. Studies on allelopathic effect of agroforestry crops. Int. Tree Crop. J. 1987;4:109-115.
20. Vergara BS. Crop response to light variations. In: Gupta US, ed. Crop Physiology. New Delhi: Oxford &lB Publishing Co; c1978. p. 137-156.
21. Mukhtar A, Butt MM. Intention to choose Halal products: The role of religiosity. Journal of Islamic marketing. 2012 Jun 22;3(2):108-20.