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Influence of Light Intensity on Seedling Growth of *Alangium lamarckii*

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ABSTRACT

Light intensity is considered one of the critical environmental factors affecting seedling development and performance. This study was executed to determine the effects of varying light intensities on the growth of *Alangium lamarckii* seedlings exposed to three different conditions, namely, 100%, 45%, and 20% light intensity. Data obtained from the study results indicated that the average seedling growth in 45% light intensity condition was greatest, which was closely followed by seedlings in two other light conditions of 100% and 20%. Higher growth of seedlings in 45% light can be attributed to favorable microclimatic conditions observed with the use of moderate intensity light, namely, optimum humidity and moisture which would reduce stress and improve seedling growth. Relatedly, too much exposure to light as well as the considerable decrease in light intensity were noted to be less beneficial for suitable seedling performance. This is evidenced by the fact that *A. lamarckii* seems to prefer partial shade in the early growing period. The findings of the study indicate that the light intensity of around 45% creates favorable conditions for nursery management as well as early growth of its seedlings.

Introduction

Light intensity is another factor that influences the growth of seedlings. The basic requirement for seedling growth is adequate supply of nutrient, appropriate regime of moisture, suitable temperature, and good porosity of soil. The influence of light (intensity and quality) has a great significance on the germination of seeds and growth of seedlings. With the help of light, seedlings performance the process of photosynthesis in which electromagnetic energy is converted to chemical energy that can be used for various biosynthetic processes. In the simpler terms, photosynthesis is the conversion of light energy into chemical energy. The effect of light on germination has been known to vary considerably with the seeds of different species. Some seeds germination after being given a brief illumination, while some are in different to the presence or absence of light during germination (Schmidt, 2000). A high light intensity also has an important effect of raising leaf temperature somewhat oppose the prevailing temperature, of the surrounding atmosphere and may thus influence photosynthetic indirectly by its effect as thermal condition within leaves. Consequently influence the timber quality many plant species are shade loving and light demanding during their early phase of life. The quality of light also influences the rate of germination and seedling growth. In lettuce seeds, the growth is stimulated by red light and inhibited if the seeds are subsequently illuminated with far red light. It has been concluded that the effect of light on seedling growth is Phytochrome mediated (Srivastava, 2003).

The light condition plays an important role in establishment of seedlings. The influence of light intensity and quality on the growth of plants has been studied by many workers in different species viz. Bahuguna and Lal, (1992) in *Celtis australis*, Saxena *et. al.*, (1995) in *Delbergia sissoo*, Acacia catechu and Casuarina equisetifolia, Naidu, *et. al.*, (1998) in different deciduous tree species and Khan, *et. al.*, (2002) in *Mesua ferrea*. Luna and chamoli (2008) have studied the impact of light upon tree species (*Albizia procera*, *Eucalytus tereticornis* and *Acacia catechu*)

and concluded that plants under shade produce better growth and biomass parameters than under direct sunlight.

Vyas and Nein (1999) have studied the effect of shade on the growth of *Cassia ungustifolia* and reported that increased plant height, number of nodes, mean inter nodal length and various growth parameters and the promotary effect was more prominent at 25 percent shade. According to Saju, *et. al.*, (2000), species are different with regard to their shade responses, the growth performance and seedling parameters like, diameter, leaf area, leaf size, root and shoot weight and chlorophyll content of *Tectona grandis* and *Grevillea robusta* was better in full sunlight than in shade while *Allianthus triphysa* seedlings performed well under shade.

Chaturvedi and Bajpai (1999) have studied the effect of different light conditions on germination and seedling growth of some selection forest tree species viz. *Bridelia retusa* (Spreng), *Holarrhene antidysenterica* (Wall), *Lagerstroemia parviflora* (Roxb.) and *Wrightia tinctoria* (R.Br.) and considered that root length was found maximum under semi-shady conditions in *Bridelia retusa* and *Holarrhena antidysenterica* and in contrary to this the length of root was reported higher in *Lagerstroemia parviflora* and *Wrightia tinctoria* in full sunlight conditions. According to Kumar, *et. al.*, (2007), the seed germination and seedling growth of *Azadirachta indica* remained unaffected with light condition.

Tiwari, *et. al.*, (2000) have thrown light on the effect of different light conditions on seedling growth of some selected leguminous forest tree species viz. *Albizia odoratissima*, *D. latifolia*, *Ptericarpus marsupium*, *H. binnata* and *O. delbergioides* and suggested that the root/ shoot ratio and plant length was maximum under full sunlight condition in all the species expect *Albizia odoratissima* where root/shoot and plant length was maximum in semi-shady condition, they concluded that the species which showed better growth in full sunlight condition may be light demander during their early phase of seedling growth.

Material and Methods

The experiment to observe the effect of different light condition on seedling growth was conducted in Banguon forest nursery. Three light condition conditions i.e. semi shady or under tree canopy (I), Full sunlight or open (II) and imbibe seeds (150) were sown in perforated polythene bags of 25X10cm. size. Forest soil, sand and organic fertilizer (FYM) in the ratio of 2:1:1 was used for experiment. Two months old seedlings were transferred in large perforated polythene bags of 75X25cm. size. Therefore polythene bags were shifts in full sunlight, semi-shady condition (under tree canopy) and in shady condition (under hut lobby) providing them approximately 100, 45 and 20 percent light respectively. Fifty polythene bags were used for each treatment. Regular watering was done to these sets to provide sufficient moisture level. The experiment was continued for 10 minutes. The measurement of light intensity was using by Lux meter from time to time.

Table-1 Abbreviations Used In The Experiments Performed At Nursery To Represent Growth Parameters Of Seedlings In Relation To Different Treatments.

S. No	Light Condition
1-	(L ₁) Full Sun Light
2-	(L ₂) Semi-Shady
3-	(L ₃) Shady

Results and Discussion

The results of effect of three different (20, 45, 100) light intensities on seedling growth are given in Table-2 and Figure-1 to 5. A perusal of Table-2 indicates that, an average maximum length of root (65cm.) and shoot (48.5cm.) was obtained in 45 percent light (II) (under tree canopy) condition, while the minimum was 20 percent (III) i.e. 20.9 cm and 8.35 cm. respectively. The root and shoot dry weight also followed similar pattern. The maximum root dry weight (2.992 gm.) was obtained in 45 percent light (II) followed by 1.685 gm in 100 percent light (I) and minimum (0.992gm.) in 20 percent light condition. The ratio of shoot/Root dry weight ratio show a different trend, as it was maximum (0.635gm.) in 20 percent light (III) and decrease gradually in 45 percent light (II) to 100 percent (I) light condition respectively.

The maximum dry weight (4.822 gm.) of the seedling was found in 45 percent light followed by 100 percent (3.012 gm.) and 20 percent (0.443 gm.) light respectively. The average maximum moisture percent of shoot (81.08%) and root (86.38%) were also observed in semi-shady light condition (45 percent) and it is minimum in (61.197%, Shoot and 66.190% root) 20 percent (III) light condition.

The maximum photosynthetic area shows a different trend, as it was maximum (291.2cm²) in 100 percent (I) (Full sunlight) followed by 45 percent (245cm²) and 20 percent (60.2cm²). Maximum length of seedling 99cm. was found in the seedlings grown under 45 percent (II) light intensities while average minimum length of seedlings was reported 31.25cm. in 20 percent (III) light condition. This behavior may be due to the moderate humidity and favourable microclimatic conditions under 45 percent light. The growth under full sunlight was not satisfactory in Butea monosperma, which may be due to increased temperature and decreased moisture in soil. Many workers (Bhargava, 1951 and Mathur, 1956) have indicated essentially of partial or lateral shade in the earlier stage of seedlings of certain species to protect them from drought.

The maximum shoot/root length ratio shows an increasing trend gradually in 45<100<20 percent light condition. The number of leaves was observed higher (31) in 45 percent light followed by 100 (21) and 20 (11.5) percent light intensities. The maximum average collar diameter was recorded (14.59cm.) in 45% (Semi-shady condition), followed by 100 percent (10.90cm) and 20 percent (8.09cm.).

The average growth remained higher under 45 percent light followed by 100 and 20 percent light. This behavior may be due to the moderate humidity and favourable microclimatic conditions under 45% light, Tripathi, 1984 has also reported the same response

of light condition on seedling growth of *Anogeissus pendula* Adgew at early stages.

The environmental factors such as temperature and soil moisture are modified to same extent in shady condition. The trend of shoot/root growth and shoot/root dry weight ratio in seedling of *Alangium lamarkii* may be due to the needs of the species with response to the microclimatic requirements viz. temperature, humidity, microbial flora and soil condition.

The absolute light condition may have an adverse effect on the growth of seedling due to increased temperature and decreased moisture in soil.

Table- 2 (A) Effect of different light condition on various parameters of one year old seedling of *Alangium lamarkii* (Average value of 5 measurements.).

Various measurement of seedlings	Light condition Full sunlight		
	Max.	Min	AV±S.E..
Total no. leaves of Seedlings	32	19	21±3.705
SL(cm.)	48.75	35.50	39±3.07
RL(cm.)	61.50	41	46.75±3.502
PL(cm.)	110	76.50	84.55±6.365
S/R L ratio	0.792	0.889	0.723±0.427
SDW (gm.)	1.96	0.48	0.91±0.702
RDW (gm.)	2.05	0.34	1.685±0.262
PDW (gm.)	5.12	0.64	3.0±120.566
S/R DW ratio	0.976	0.823	0.446±0.679
Collar Diameter	17	6	10.90±2.312
%M.C. in Shoot	81.094	65.57	69.01±2.592
%M.C. in Root	89.176	39.724	76.58±4.025
PSA (cm ²)	361.5	144.3	219.2±14.898

Table- 2 (B) Effect of different light condition on various parameters of one year old seedling of *Alangium lamarkii* (Average value of 5 measurements.).

Various measurement of seedlings	Light condition Sami-shady		
	Max.	Min.	AV±S.E.
Total no. leaves of Seedlings	43	21	31±5.765
SL(cm.)	65.25	49	48.5±2.560
RL(cm.)	69.75	53	65±8.836
PL(cm.)	135	102	99±4.405
S/R L ratio	0.865	0.925	0.844±0.472
SDW (gm.)	2.04	0.280	1.63±0.136
RDW (gm.)	3.682	0.442	2.992±0.265
PDW (gm.)	6.62	2.720	4.822±0.125
S/R DW ratio	0.618	0.606	0.615±0.513
Collar Diameter	22	5.2	14.59±3.146
%M.C. in Shoot	98.667	308	81.08±4.92
%M.C. in Root	110.35	80.168	86.38±2.26
PSA (cm ²)	342.5	143	245±19.648

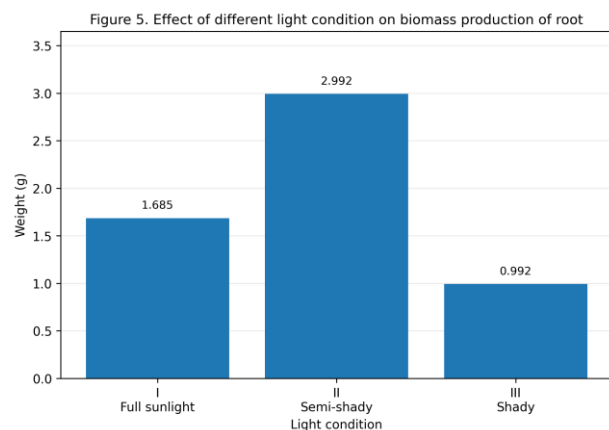
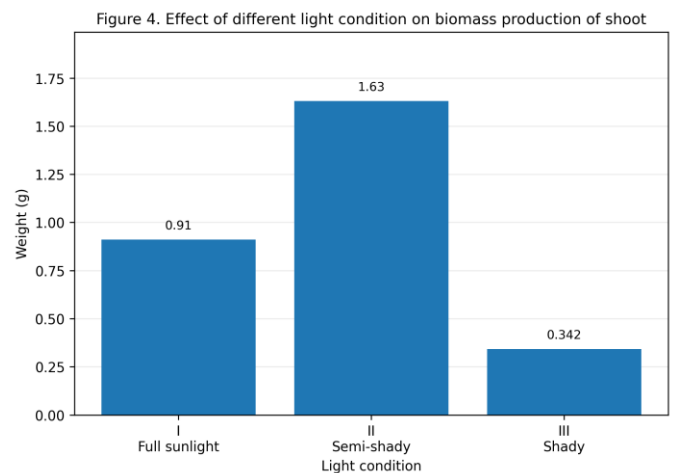
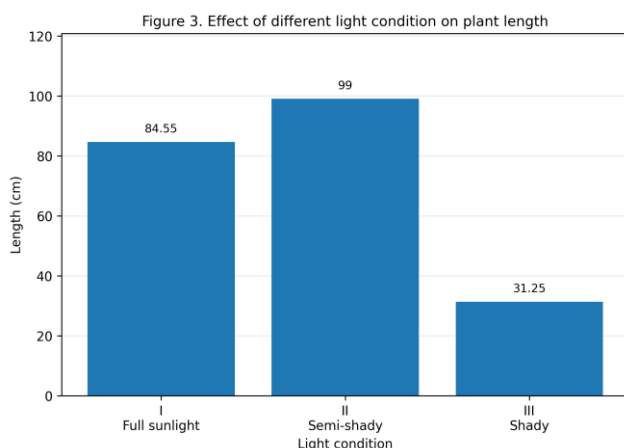
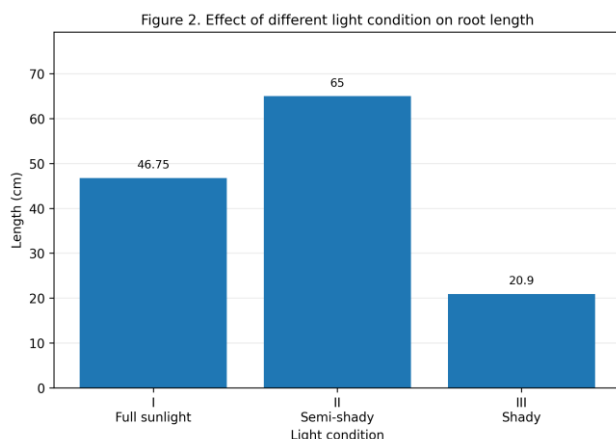
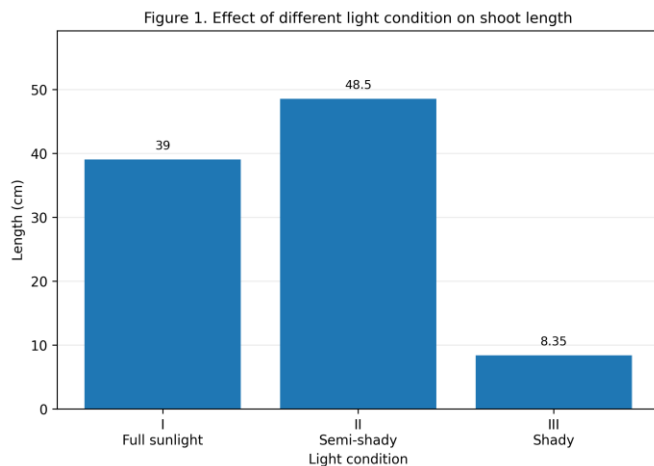
Table- 2 (C) Effect of different light condition on various parameters of one year old seedling of *Alangium lamarkii* (Average value of 5 measurements.).

Various measurement of seedlings	Light condition Shady		
	Max.	Min.	AV±S.E.
Total no. leaves of Seedlings	14	9	11.5±2.05
SL(cm.)	19.5	6	8.35±0.397
RL(cm.)	24	10	20.9±4.03
PL(cm.)	43.5	16	31.25±3.57
S/R L ratio	0.812	0.61	0.298±0.098
SDW (gm.)	0.69	0.25	0.342±0.07
RDW (gm.)	1.14	0.64	0.992±0.265

PDW (gm.)	1.71	0.194	0.442±0.137
S/R DW ratio	0.605	0.115	0.635±0.437
Collar Diameter	9	4	8.09±2.277
%M.C. in Shoot	78	58.61	61.197±2.81
%M.C. in Root	79.352	60.571	66.190±5.893
PSA (cm ²)	98.5	51.5	60.2±21.308

Table-3 Indicates the value of quality index (QI) and Sturbiness Quotient (SQ) of seedling of *Alangium lamarckii* grown in different light condition.

Light condition	QI	SQ
Full sunlight	0.119	7.742
Semi-shady	0.245	6.785
Shady	0.095	3.862



Conclusion

In conclusion, the present research shows that light intensity is effective in affecting the growth and quality of *Alangium lamarckii* seedlings. Among the three light treatments, the semi-shade condition with about 45% light was the best in all aspects concerning seedling performance. Under such condition, the seedlings showed greater shoot length, root length, total plant length, leaf number, collar diameter, root and shoot dry weight, and total biomass. The maximum seedling length was recorded at 99 cm, while the maximum number of leaves at 31 and collar diameter at 14.59 cm was recorded at 45% light, which indicates that the partial shading is good for seedling initial growth. Furthermore, the semi-shade condition gave the best seedling quality index (0.245) compared to the full sunlight (0.119) and the shady condition (0.095). On the contrary, the seedlings grown under the light condition of just 20% had poor growth under the nursery conditions. Thus, although light condition of full sunlight was better than the heavy shade in terms of the seedling growth, it was not as good as the semi-shade light condition of 45%. The superior growth over the moderate shade is likely to be attributed to suitable humidity, moisture conditions, and microclimatic conditions. Overall, the results of the study suggest that *Alangium lamarckii* has a semi-shade nature during its early growth phase and about 45% of light is optimal for the normal growth of seedlings under nursery conditions.

References

- Bahuguna, V. K. and Lal, Pyare (1991). Effect of shade and mulch on germination of *Toona ciliate*. Indian For., 116(7): 942-945.
- Chaturvedi, S. K. and Bajpai, S. P.(1999). Effect of light condition in Root, shoot and Plant length of selected forest tree species. Indian For., 125(7): 725-729.
- Khan, M.L., Bhuyan, P., Singh, N.D. and Todaria, N.P. (2002). Fruit set, seed germination and seedling growth of *Mesua ferrea* (Clusiaceae) in relation to light intensity. J. Tro. For. Sci., 14(1): 35-48.

- Kumar, Devendra, Mishra, D.K. and Singh, Balbir (2007). Effect of temperature, media and light on germination of Neem (*Azadirachta indica* A. JUSS.) seeds. Indian For., 133(12): 1636-1642.
- Luna, R.K. and Naresh, Chamoli (2008). Evaluation of quality of seedling raised under agro-net shade and direct sunlight. Indian For., 134(1): 17-25.
- Naidu, C.V., Chandra, M. and Swamy, P. M. (1998). Influence of shade on growth and biomass production in five tropical deciduous tree species. J. Tro. For., 14(IV): 204-206.
- Saju, P.U., Gopikumar, K., Asokan, P.K. and Anil, J.R. (2000). Effect of shade on seedling growth of *Grevillea robusta*, *Tectona grandis* and *Allianthus triphysa* in the nursery. Indian For., 126(1): 57-61.
- Schmidt, Lars (2000). Planning and preparation of seed collections. Guide to handing and subtropical forest seed (Kirsten Olesen, ed.) Danida forest seed Centre, Humleback, Denmark pp. 292-293.
- Saxena, A. K., Rao, O.P. and Singh, B. P. (1995). Effect of shade on seedlings growth of *Delbergia sissoo*, *Acacia catechu* and *Casuarina equisetifolia*. Ann. For., 3(2): 152-157.
- Srivastava, H. S. (2003). A text book of Plant Physiology and Biochemistry, Rastogi publication, Meerut. pp.-303.
- Tiwari, Pradeep K., Bajpai, S. P., Agarwal, Ravi and Kiran, Savita (2000). Studies in the effect of different light conditions on seedling growth of some *Leguminous foret* tree species. J. Trop.
- Vyas, S.P. and Nein, Saroj (1999). Effect of shade on the growth of *Cassia ungistifolia*. Indian For., 125(4): 407-410.